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INDIAN JOURNAL OF POWER & RIVER VALLEY DEVELOPMENT

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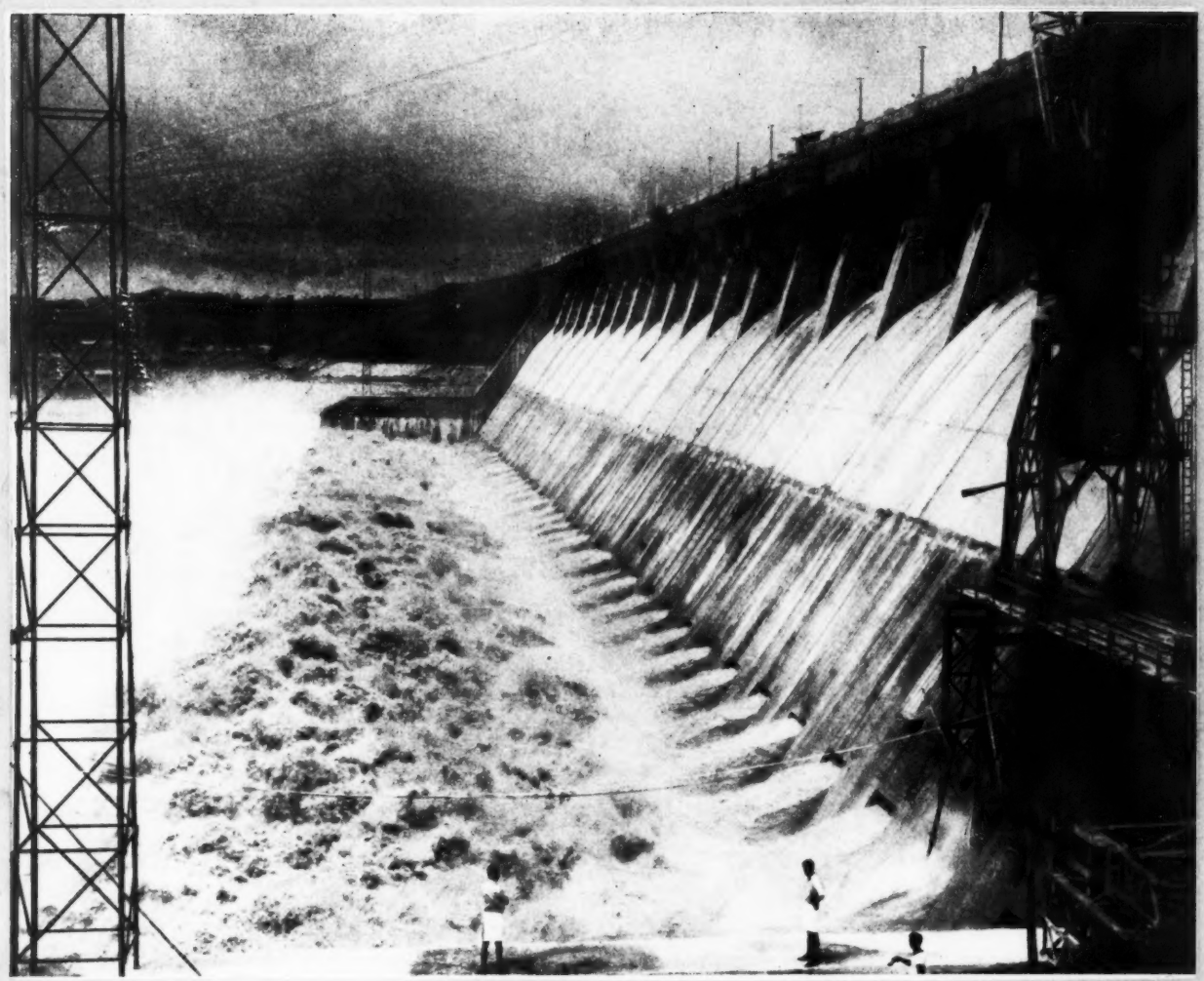

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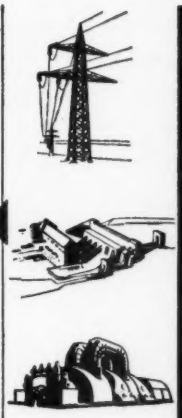

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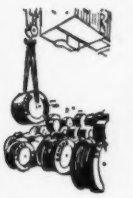

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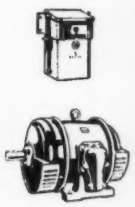

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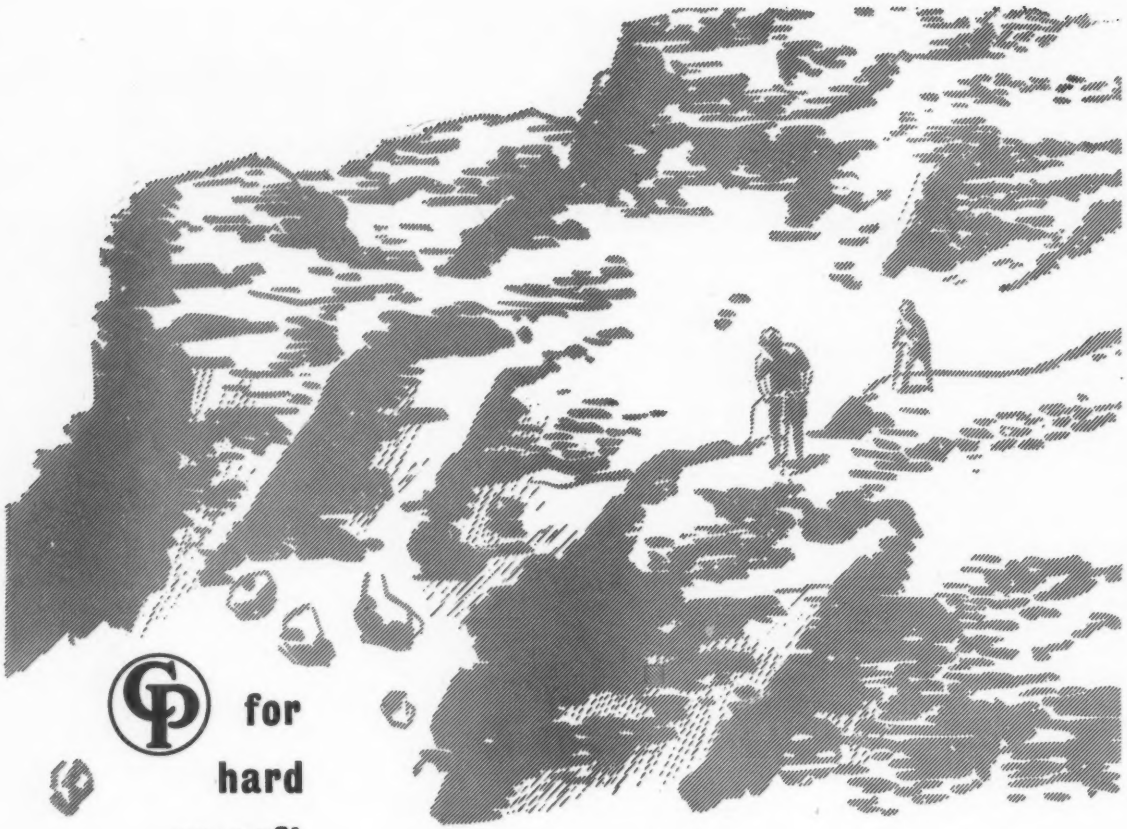

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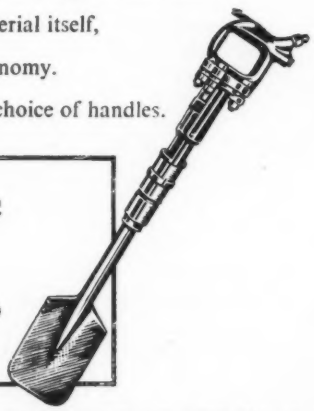

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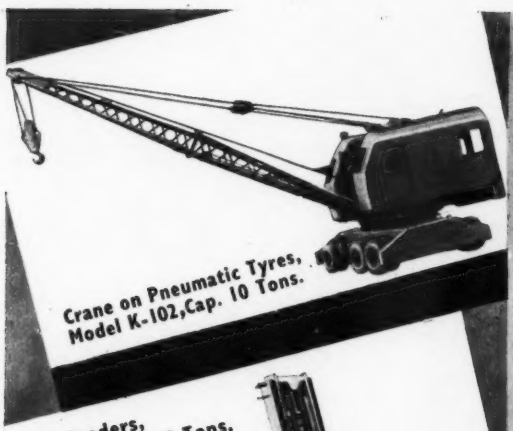

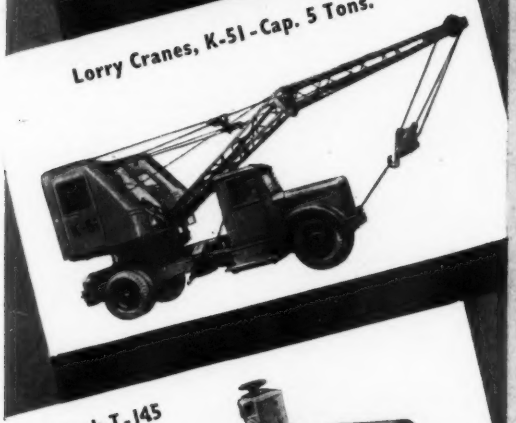

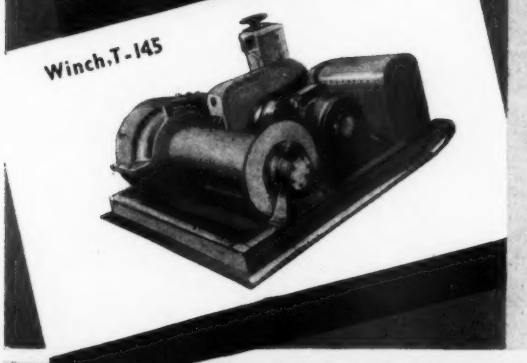

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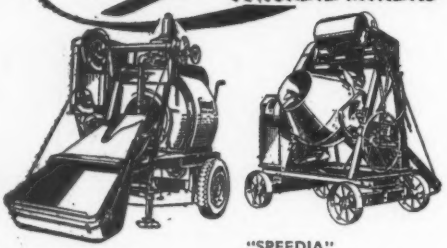

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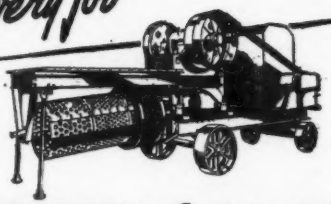

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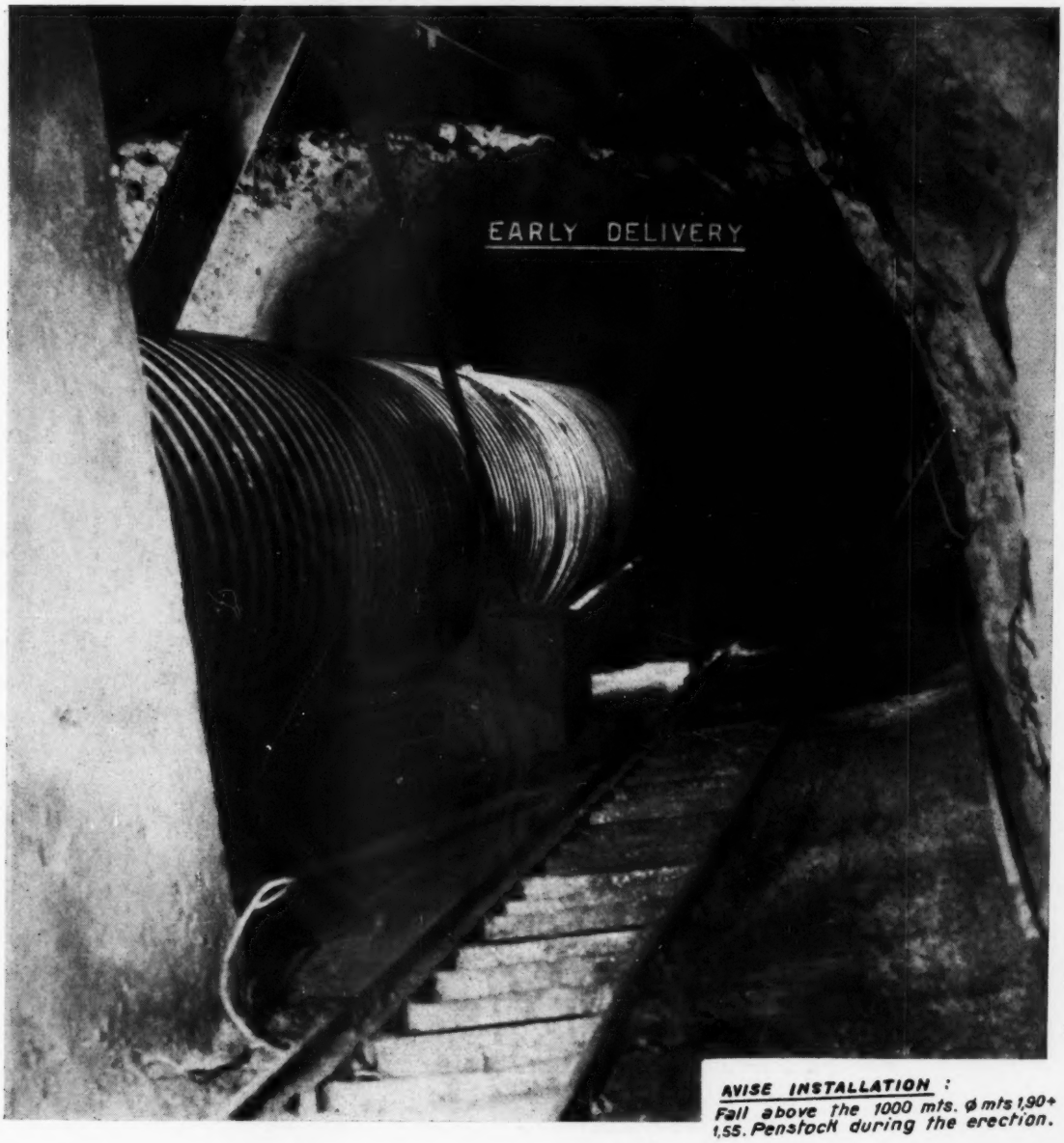

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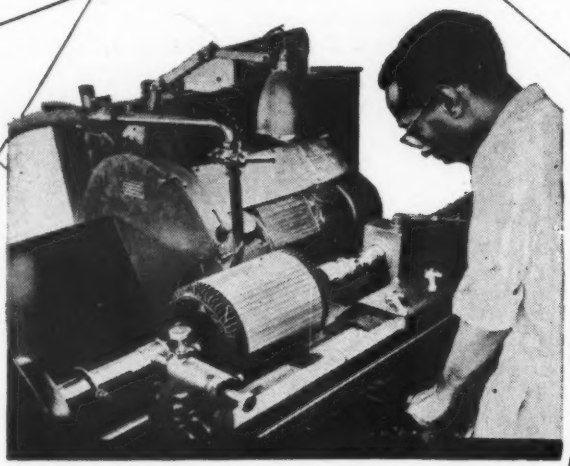

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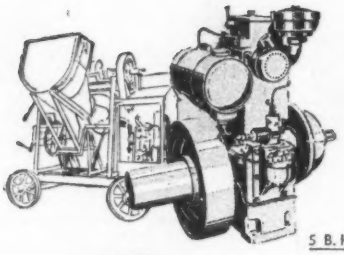

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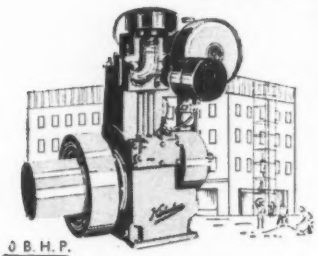

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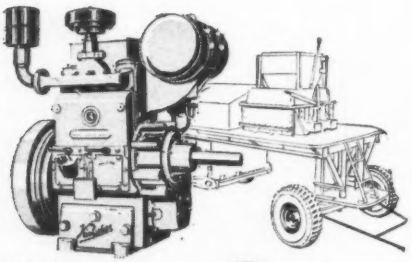

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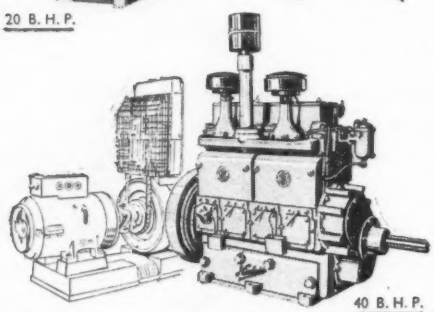

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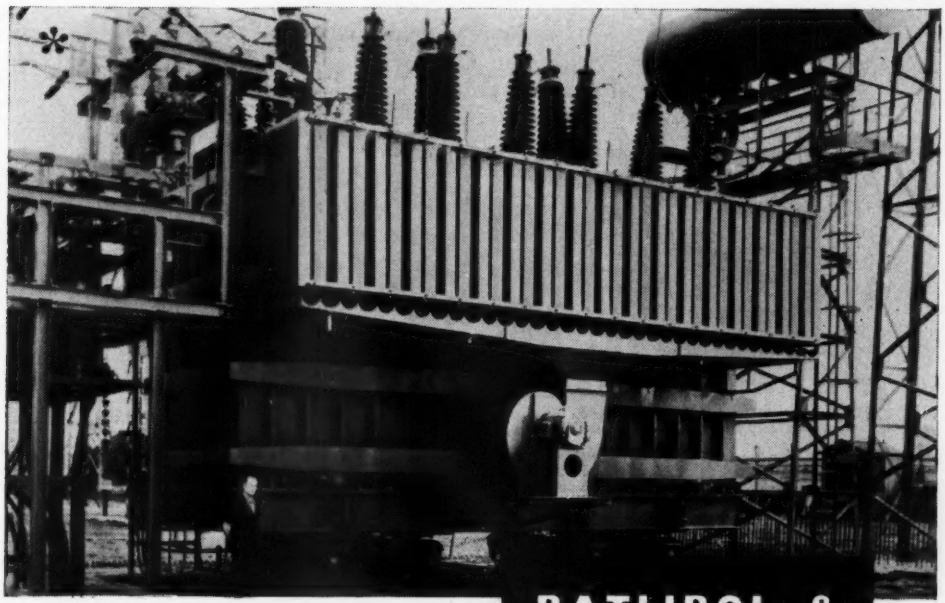

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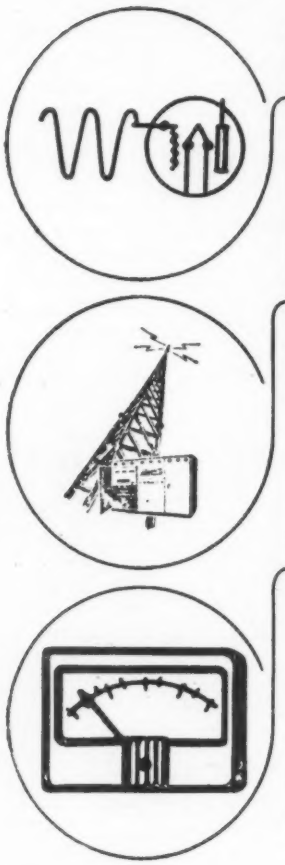

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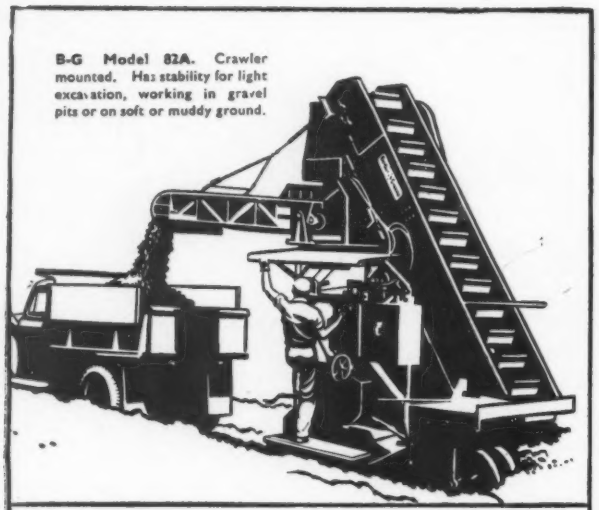

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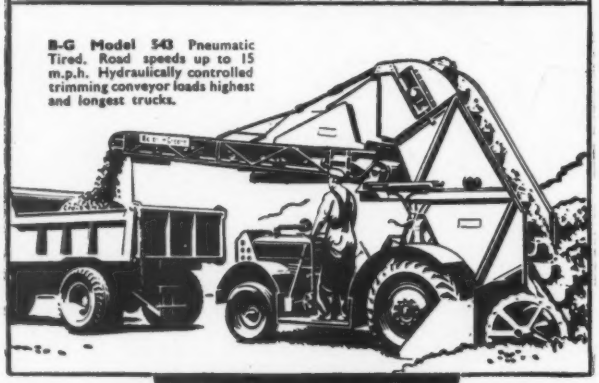

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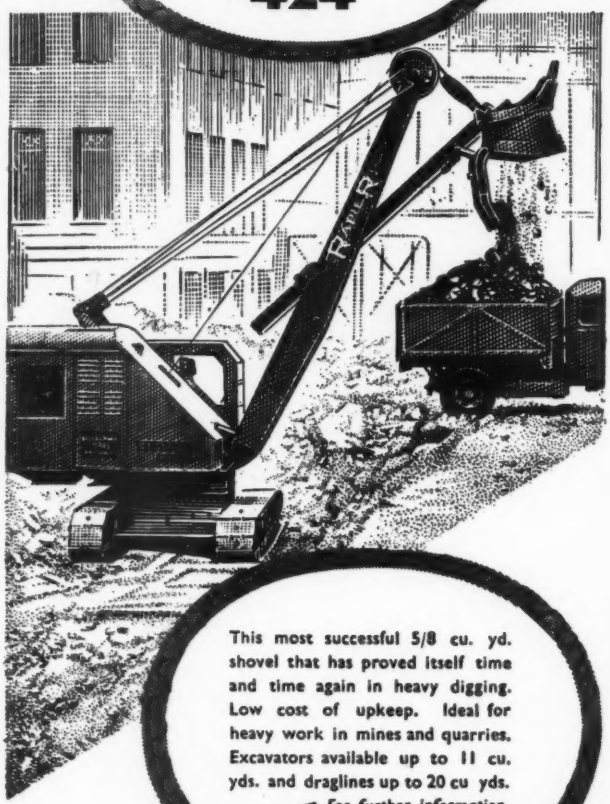

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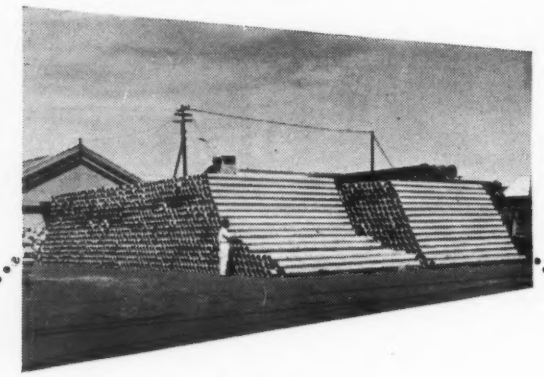

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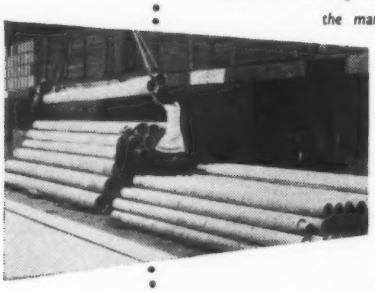

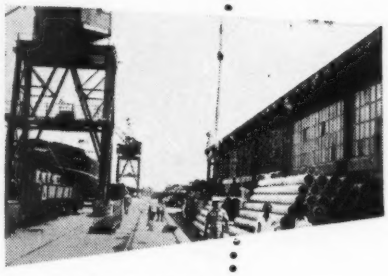

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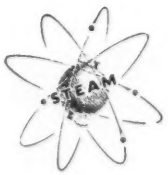

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CONTENTS

PLANNING A NEW INDUSTRIAL CULTURE	*A. E. Morgan*	1
FLOODS OF 1956	*G. L. Nanda*	7
MADRAS PLANT EXTENSION—STAGE III	*V. P. Appadorai*	11
COLOMBO SESSION OF CENTRAL BOARD OF IRRIGATION & POWER	*Baleshwar Nath*	13
IRRIGATION AND POWER DEVELOPMENT IN PAKISTAN		17
SOIL CONSERVATION IN DAMODAR VALLEY	*B. P. Sinha*	25
OUR DELHI LETTER		29
EDITORIAL		31

In the coming issue :

Steam Turbines *by* Sir Claude Gibb, Chairman and Managing Director C. A. Parsons & Co. Ltd. India's Irrigation and Power Development—some suggestions *by* C. L. Handa, I.S.E. Director, Bhakra Dam Designs Directorate. Determination of the Effect of Sluicing on Deposition *by* Dr. H. L. Uppal, M.Sc. Ph.D. F.N.I. Director & S. R. Sehgal, M.A. C. st. Mathematical-Cum-Statistical Officer, Irrigation and Power Research Institute, Punjab. Concrete Semi-Spiral Casting at Sarda Power House *by* Hari Krishna, Executive Engineer, Irrigation Dept., Uttar Pradesh. Control of High Voltage Motors by Contactors *by* Dr. M. P. Varshney, B.Sc. B.E. (Hons) Ing Dr. (Paris) Lecturer in Electrical Engineering, Indian Institute of Technology. Silt in relation to storage Reservoirs *by* B. N. Murthy, B.Sc. B.E. Damodar Valley Corpn. Implementation of the Plant and Machinery Committee's Recommendations—A Report. Metropolitan Water Board for Calcutta—A Report.

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Planning a New Industrial Culture

A. E. MORGAN

Dr. Morgan is welknown to our readers as an internationally-famous engineer and educationist. His latest book "Search for Purpose" was recently reviewed in this journal. This contribution by him based on his lengthy reply to an Indian social worker regarding the complex problem of decentralised industrialisation coupled with that of unemployment and under-employment in India. The recent Karve Committee Report has given a definite bias towards the solution of this problem and it generated a great deal of controversy. There is no doubt that this is a very important problem for under-developed regions suffering from the consequences of a great population-pressure. Dr. Morgan provides here a comprehensive outlook and approach that is atonce modern and yet satisfying. This has relevance to river valley projects in the sense that river valley schemes provide a great opportunity for a dispersed form of industrial layout. We commend this article strongly to our readers.

AUTHOR

I believe it is important that conditions should exist which favor the continuance of vigorous family and small community life. This conviction grows, not from any abstract theory, but from much first-hand observation and inquiry. For instance, one of the most thoroughgoing and extensive studies of human societies ever made, extending over ten years, by highly qualified men, was the "Cross-Cultural Survey" made by the Institute of Human Relations of Yale University. In this study of 250 human societies, ancient and modern, and scattered over the whole earth, the conclusion was reached that "*The community and the nuclear family*, that is, a family of parents and children, sometimes including other close relatives, *are the only social groups that are genuinely universal.*"

The community and the family are as necessary as they are universal. They have been the chief means by which the basic and most necessary elements of human culture are preserved and passed on from generation to generation. If they perish, then human society tends to disintegrate. If they are greatly impoverished, as by migration of the best elements from community to city, then in time the entire society deteriorates. I shall not take time to give the evidence for this conclusion, but it comes from all over the world. Neither shall I take time to discuss apparent exceptions, as where fine quality persists in metropolitan life, or where small communities become degenerate. I believe that the conclusion is generally valid.

It does not follow that all communities and all community traits, or that all families and family traits, are good. Everyone knows that a large proportion of both families and communities are petty and mean and very unideal. Yet it remains true that families and communities are the best means the human race has developed for preserving the best of its culture, such as human compassion, mutual confidence, affection, mutual helpfulness, honesty, and other such qualities on which human society depends. Therefore I believe that in any plans for increasing human well-breing through industrialization it is very important that they take into account the need for maintaining family and society at their best.

Another desirable condition for a good society is that men shall be free—not slaves either to men or to organizations or to machines or to circumstance. It is natural and reasonable for a man to wish his time and efforts to be used so effectively that only a minor part is necessarily used for meeting the bare necessities of life, and so that the rest can be used for fulfilling his normal and desirable purposes. The poverty of India is due primarly, not to the natural poverty of the country or to lack of natural ability of the population, but to habits of mind and to structure of life and industry which make it necessary for most men to spend nearly their whole lives for bare survival. It is only a century or two since the western world was in the same condition. I have made rough comparisons of the time necessary for doing certain work by old craft processes, and for accomplishing the same results by the use of modern technology. In various kinds of work I am certain that more than a hundred times as many man-hours are necessary for obtaining a given result by the old handicraft processes as by modern technological methods. That almost certainly means poverty for those who must live by the very inefficient means.

Most Indian speakers and wirters who urge villagers to continue with their ancestral crafts are not themselves limited to that kind of life. They travel, they address audiences, they have varied and often interesting experiences, they meet interesting people. Gandhi lived with great frugality and simplicity, yet how much more exciting, interesting and varied his life was than that of a village craftsman, bound to his narrow round of duties and producing barely enough to keep alive. It seems natural and right that the poor villager should desire the advantages of technology, which will enable him to produce ten or twenty or a hundred times as much with an hour's work, and thereby make a comfortable living and have some surplus time for his interests.

Much has been said and written about the uninteresting monotony of routine factory work. There has been a good deal of merit in that criticism in the past. However, much of the criticism was the result of the lack of imagination and human considerateness of those managing the machines. It is more and more being found that men and women actually do more and better work when they are moved about from one job to another, which relieves routine and drudgery, and adds variety and interest. A well

managed modern small factory may have greater variety and interest than the small farmer gets from his raising of crops.

There is another reason why fear of dull routine need not be much of a permanent dread. With modern "automation" a large part of the dull routine is being taken away from men and is being done by machines. This means that men are being needed more for managing and directing, and less for routine drudgery. One difficulty is that many men and women prefer routine work over that which calls for any degree of management.

If a villager is wise, he will not want to exchange one servitude for another. He will not want to grind out his life working for a great organization which will see him almost as part of the machinery. Neither will he want to be in servitude to totalitarian industry where he is directed by forces which order his life for purposes which he has no part in determining. It is no better to be a slave to a machine or to the owner of the machine than to circumstances. Moreover, if the villager is wise he will want the benefit of technology without the destruction of family and community life.

There are other benefits of small community life which the wise villager will not want to lose. There are the open spaces of the village, especially necessary for growing children. There is the value of locally managing local affairs, which has been sadly interfered with, but which is still a normal and reasonable desire. There are the advantages of neighbourhood life among trusted friends. This, too, has been greatly interfered with, but still remains a natural desire.

There are some genuine advantages of the city which the small community has lacked. There are libraries of books and magazines, there is wider choice of friends, there are opportunities for travel, for having some variety in life. With wise development of technology many of these benefits can be brought to the small community, and with good income there will be a margin of time and of finances which will make possible some travel or other desirable experience.

One of the chief lacks of the small community is opportunity for education. If a community has a good income of its own it will not need to beg from the general government. It will be able to afford education. With wise planning and guidance, making a living can be made a part of education, and education can contribute to making a living. Workers can learn while they earn, and earn while they learn.

There are several reasons why large mass industries interfere with the fulfillment of life in the ways I have indicated. In great industries, whether under private ownership and management or socially owned and operated by the government, the individual worker has, in fact, little to say about the management as a whole. That is apt to be determined by some industrial plan at the top. It is possible in a well run small industry for employees to know all about the business, and to share in the making of policy. This is not in the usual industrial tradition, but it has happened often enough to indicate its possibility.

Quite commonly workers in a large mass industry must give up the community life we have mentioned. Often they must have crowded living conditions. If they are out of work for a time they have no home setting where they can raise a little food and be at home among neighbours who do the same. School conditions around a big industry tend to be crowded, and parents have little to say as to what goes on in the great school organization.

The above are a few reasons, put down at random, for coming to two conclusions :

First, that *modern life calls for the advantages of technology.* I shall not take time to tell why I think that old-time handicrafts, even with such modernization as is possible without changing their general character, will become more and more obviously obsolete. To keep them alive until something else can take their place may be necessary and wise, but only as a temporary expedient. There may be some exceptions, and if so they should not be overlooked, but I believe that this statement as a whole is sound.

Second, that *to as great an extent as possible technology should develop in reasonably small units,* which can be successfully located in the vicinity of villages and small towns, so that the workers can maintain community associations, keep alive the community spirit, and have the relatively open life which is possible in the setting of a small community.

Almost certainly some large mass industries will be developed, sometimes because they are inherently most officient, and sometimes because men's attention has been directed to the economics of size, rather than to trying to get the highest efficiency from small units. Big industry makes the top men seem bigger, just as a king who conquers another country and adds it to his own is looked at as a bigger king, regardless of whether the conquered country is better governed than before. We have little idea what the results might have been if equal attention had been given to making small size efficient.

Yet even in big industry the disadvantage of size is being somewhat recognized. A prominent English shoe industry, after years of study of the matter, has been breaking up its business into small units, each located in a small village. One of the largest and fastest growing and most profitable American electrical firms makes it a point to locate all of its plants in villages or small towns of 2000 to perhaps 10,000 population.

It seems entirely possible for a large part of Indian industry to develop successfully as small industries, located near villages or small towns, industries which would supply many present-day needs by modern technical methods. I believe that in general this would be better for India than would reliance either on large mass industry or on efforts to modernize old-time handicrafts.

It would be unwise for India to take one small step at a time toward carrying out such a program, as by slightly modernizing village crafts. The industrialized world is moving, too, and such halting steps would leave India going along fifty years behind, until in her desperate need she would turn to centralized

mass industry. It may be no more difficult to learn the best modern ways than to learn the ways of fifty or a hundred years ago.

The difficulty in getting a program of small, modern technical industries under way is in getting a desirable pattern to work by and to live by. Very few industrialists have such a pattern in mind. Most of them have given little if any consideration to the importance of maintaining family and small community values, or of having the workers share in the management and direction of the industry. Most industry has followed the prevailing patterns of seeking for personal bigness or for industry bigness, or have seen moderate-sized industries as the property of individuals or small groups, often with little responsibility for the communities in which they were located. This has not been chiefly a matter of public or private ownership. Socialist societies have similarly ignored and disrupted family and community life to build massive industries. Oten socialist regimes have definitely sought to undermine the independent spirit of local communities, as that spirit tended to resist their indoctrination. Totalitarianism does not harmonize with independent community life any more than does mass private industry harmonize with community. *Neither existing private industry nor existing socialized industry presents a pattern which can be borrowed as it is.* India will need to create its own pattern. I am going to make a number of suggestions as to how I think a pattern might be created which would accord with the new spirit and the needs of India.

I believe that a pattern might be introduced on a village level, using the best modern methods on a small scale, and without disrupting the desirable elements of the family and village structure. One of the first necessities is to get a clear picture of what it is desirable to aim at.

I think that the aim, sometimes advocated, of having each village mostly self-sustaining by its own industrial effort, is *not* desirable. Efficient production calls for larger-scale operation than is possible if the market is just one village or a small group of villages. In many cases a little industry employing 20 to 50 persons could produce all of some kind of goods that would be needed for several hundred villages, and everyone would get a better and cheaper product, than though there was an effort to produce on the village or local area level. Some small industries with a few hundred workers might produce enough of some special products to supply all india.

Efficient and socially wholesome production would depend more on the attitude and spirit of management and of the workers than even upon technical skill, though of course technical skill is highly important. The way in which the industries were organized as to ownership, management, and policy control would largely determine whether a high level of technical competence would be maintained, along with sound social purpose. I shall touch on those elements later.

To begin such a program it would be well to find a few persons in Switzerland, Germany, Sweden, the United States or Canada who are technically competent and are experienced in the best modern industrial practices, and who yet have strong social purpose, which would make their work an effort to establish a sound social and industrial policy for India, and not just to make some money for themselves. They should leave behind them any standards which measure success by the amount of wealth and prestige which one or a few individuals may acquire by owning or controlling an industry. There are such men among the industrially competent men of every industrialized country. Some large, well managed Indian industry might cooperate by supplying a few trained industrialists. These men would contribute what one might call the industrial culture—a first hand knowledge of how a modern industrial business is organized, operated and managed.

Such knowledge does not depend simply on natural intelligence. If one should want to learn how to catch seals he might well go to the Eskimos, if he should want to learn to raise dates he might well go to the Arabs, and if he should want to learn the best industrial methods he should learn from those who have gone furthest in that field. That skill has grown most rapidly in Europe and America. In America, for instance, many thousands of industrialists have been practicing, experimenting, researching, learning from experience, comparing their results which each other, and competing with each other, and out of this process there has been a rapid evolution of industrial methods leading to highly efficient and economical production, under conditions which are increasingly wholesome for workers. A very up-to-date business executive of a hundred years ago would be relatively crude, inefficient and out-of-date today. It is that general pattern of skillful and economical production rather than any special natural advantages, which has led to America's success in industrial production. The part of the country which pioneered in this development—New England—was naturally the poorest part of the country, with poor soil, rigorous climate, and few natural resources. Another part of the country which had milder climate and much greater natural resources, but which depended on cheap, servile labor rather than on industrial pioneering, was the slowest to develop. In some fields of modern industry two generations ago America did not try to begin at the beginning, but brought in exceptionally able men from Germany, England or Switzerland. Otherwise it might have taken America another fifty or hundred years to get started in those fields. Germany in turn learned from England, and then ran ahead of England.

For an American today to try to create an industry by his own intelligence and effort without taking advantage of this long development of industrial competence would have very small chance for success. For a small industry in India to try to succeed without taking advantage of this "know-how" of European or American industry would be an unnecessarily difficult and wasteful process, though not necessarily impossible. India may well take advantage of the industrial skill and experience which have been steadily growing and spreading from country to country through recent centuries.

Assuming that two or three competent and socially-minded men are available for starting an industry, the next step might be for them to become acquainted with the situation in India. They should try to find out a number of products which are useful and greatly

needed. Where feasible these should be products now imported, as in such case the development of a local industry reduces the amount of money which must be sent out of the country, and does not take the work away from local labor.

However, the course of progress may call for temporarily displacing local labor. For instance, we see men lifting water from a lower to a higher level for irrigation by dipping it up in cow hides. A modern irrigation pump would accomplish perhaps a thousand times as much per man-hour of work. But that cheaper irrigation water would produce more crops and require more men to take care of them, and would result in more work, rather than less. That has been the remarkable result of "labor saving" development in America. Sixty years ago, with relatively little technical development in America, jobs were relatively scarce. As a boy I roamed on foot hundreds of miles hunting for a job. *Today, with the remarkable development of labor saving methods, there are more jobs than men.* Even during the great depression of twenty years ago most Americans lived on a higher standard than that of their grandparents. The fear one frequently hears expressed in India of causing unemployment of introduction of labor saving machinery is largely unfounded.

Having settled on one product or a few similar products suited to modern technical production on a small scale, the experienced industrialists and their Indian associates would choose a location for the industry. The location probably should not be in a village, but in open ground near enough to several villages for workers to walk or to come on bicycles, or by bus. A site should be chosen that has good natural drainage, is not near open water where mosquitoes could breed and carry malaria, and if possible one that has natural beauty and attractiveness, or where attractiveness can be developed. A person working in an industry spends a considerable part of his life there, and there is no reason why that part should have less dignity and beauty than any other part. We need to get over the idea that there is anything mean or lacking in dignity in the process of making a living, or that dignity and beauty need not be considered for working people.

Such a site should, of course, have reasonably good transportation facilities. For an industry having to ship in heavy raw material or to ship out a heavy product, a location on a railway line may be important. For many industries, however, a location on a railroad is not important. A competent industrial adviser will look into such conditions as transportation, water supply and its quality, and other elements. It would be desirable for a site to have enough land for a settlement of houses, to be built in a way that it would be feasible for reasonably prosperous villagers to copy. Probably the immediate staff would live in such a settlement. The factory building itself should be as simple as possible, neat and attractive, but without ostentation, so it, too, could be reasonably copied..

Aside from two to four Europeans or Americans with industrial experience, it would be necessary to assemble the working staff. Perhaps from a third to a half of these might well be engineering graduates. Probably five or ten such persons would be enough to begin with. These engineers would be chosen, not because the little industry would need that many engineers, but because they could be in training to start other small industries. While having engineering or other scientific training, *their motives in coming should not be to secure large income or places of prestige for themselves, but rather a desire to be a help to India by helping to develop efficient small industries, and by training others to do the same.* I have been told repeatedly that most young engineering graduates are chiefly concerned to improve their own positions. In all of India there should be found half a dozen or a dozen who, while technically comin petent, would be eager to lay aside personal ambition in order to help make the project go, for the sake of a type of development needed in India. It would be better to work for a few years on a very small scale with a few persons of the motives I have indicated, getting them thoroughly skilled and committed to the prgram, rather than to grow much faster with a staff or personally ambitious, self-seeking persons. The success of the project, as of value to the future of India, would depend largely on the success in selecting this staff.

If there should be money enough available it would be well if such a small group of engineers, working with the two or three Americans or Europeans of industrial experience, should together work out a location for the industry, purchase the site, plan and construct the buildings, and get the industry ready to operate. This would be good training for these young men, so that after a few years they might repeat the process in getting other little industries started.

The rest of the working force probably would consist of boys and girls fifteen to twentyfive years old, *preferably persons who never had worked in an industry before,* and who from the very start would be learning good attitudes and workmanship under thoroughly competent persons. Probably both young men and young women should be employed at all levels, as they show ability and good motives.

In starting such an industry the aim should be to develop its own standards in harmony with the spirit needed for the best development of India. There should be no need of copying the personal profit motive which too often prevails in the existing industries of the western countries, nor the regimentation of thought and action which prevails in totalitarian countries. The typical western industrialist has been taught to believe that his success is measured by the financial profit to himself and to his stockholders, or by his own increase in prestige. *In fact he very often has much better motives.* That narrow profit idea is being outgrown in the West, but still remains to a considerable extent. It was part of a cultural tradition, and is no necessary part of private industry. The successful industrialist who has that attitude may have a brother, brought up in the same family and with the same general background, who has become head of a successful university. The university brother works just as hard, as intelligently and as successfully for the welfare of his institution and for its students, as the industrial brother does for profits, and with as great desire for efficient operation; but he never would think of using his job for his own financial advantage, or for the advantage of his friends, beyond the moderate salary he is paid. It is simply that

different cultural and economic traditions have come to be recognized in the different fields. There is no reason why the profits from well-conducted industry should not be used to spread industries of similar type, and there is no reason why those developing such industries should not be satisfied with such incomes as they might receive if they were managing educational institutions of similar proportions or importance.

It would be well to search far and wide for a few young graduate engineers who would work under the men brought from abroad, to learn their methods, and after a few years to undertake similar industries, perhaps with the help of profits from the first. *There is no reason why India should not get the full value of the technology which the West has developed at such great effort and expense, aad yet avoid the undue emphasis on personal profits which has gone along with that technology.* Those elements—competence and personal ambition—have been associated partly by historic accident, and there is no reason why they must be passed on together.

Given two or three Americans or other westerners who are masters of economic production, and a small group of young eingineers, the rest of the working force could be built up from the boys and young men of the surrounding villages, care being taken in each individual case to secure individuals of personal and family integrity, and of such character that they would accept the standards and purposes I have indicated. The location of the undertaking might well be determined in part by placing it where the character for the village population would make it probable that young men of fine character would be available.

It would be important that in the entire working force there should be no caste or arstocratic discrimination. *Everyone, from top to bottom, should be ready and willing to do any necessary work, no matter how menial.* The standards of Gandhi in this respect should rule. In many an American small industry one will see the owner or proprietor showing no attitude of inequality; working along side of the lowliest workers. A young engineer-educator from India who has been visiting American small industries, in writing reports of his trip said he was sometimes surprised at finding the head of a small industry, not in his office, but in working clothes, working along with common workers. This attitude has two advantages : there tends to result a feeling of understanding, fellowship, and mutual confidence ; and the proprietor, working along with the others, comes to understand the conditions of the work and the feelings of the workers as he could not otherwise. The young engineers who are chosen should be persons who are ready to give up any attitude of prestige, and are willing to work as equals with the others.

The little industry should be not only a place to make things to sell, but *should be a sort of school* where all those at work, from top to bottom, would also be going to school, trying to understand their industry, to make it more efficient, more useful, keeping up with technical and business improvements. They also should be trying to get an educated man's view of the world in which they would be working. In their work, each competent worker should get experience on different jobs, both in production, and in management and administration, so that he will become well acquainted with every part of the business. Then if he should start to operate other small industries he will be doing so with experience and competence of the industry as a whole. He should be actually giving expression to the spirit and attitudes which would be best for the new India.

There are many possible small industries, any one of which might well be started in this way. Among them are : a knife factory (it probably would be well to get the tool steel from America or Europe) : pressure cookers; mechanics' tools, such as spanners, pliers, hammers, etc. ; plastic dishes ; packaging and selling standard remedies and drugs, such as sterilizing agents, preventors of malaria, salves and lotions, adhesive bandages (often getting the raw materials bulk from abroad) ; irrigation pumps ; small sugar mill equipment ; small wheat grinders for home and village use ; parts for electric house wiring ; flashlight (electric torch) batteries ; children's books for elementary schools ; instruments and supplies for physicians, surgeons and hospitals. The list might be extended indefinitely.

The first such small industry should be a training place for equipping young men for starting and operating other small industries near by under somewhat similar conditions. In this way the process of industrializing India in a decentralized manner could proceed. Single small industries have many elements of strength and value. There may be a mutual acquiaintance and common interests which lead to better work. Those in charge can know more intimately what is going on. The individual workers can have more individual and friendly consideration for their needs and their abilities. The little industry can be located in less crowded and more wholesome surroundings. In case of sudden changes in the market the little industry can make adjustments more quickly. Those who manage the inustry commonly have a deeper interest in it. Small industries have all these and other real advantages.

Yet if they work in isolation they have some very great handicaps. One of the chief of these is that a small industry by itself cannot afford the counsel and special skills which a very large industry can afford. Unless small industries find ways for overcoming such handicaps they may have difficulty in surviving in the face of large-scale competition. There is a way of meeting this difficulty which has proved to be highly successful in some cases. Groups of small industries can cooperate to supply services which no one of them could afford by itself.

As soon as there were a few such industries in a region they should organize a cooperative center for supplying themselves with common services. The center could purchase for the several industries the materials needed for the manufacturing processes. It could supply special services, such as research in better methods, it could look after import and export licenses, it could supply special engineering services, as in building plants or planning and installing machinery. Such a central cooperative service could make financial arrangements for the member firms and could take care of legal problems. With such a

(*Continued on page* 16)

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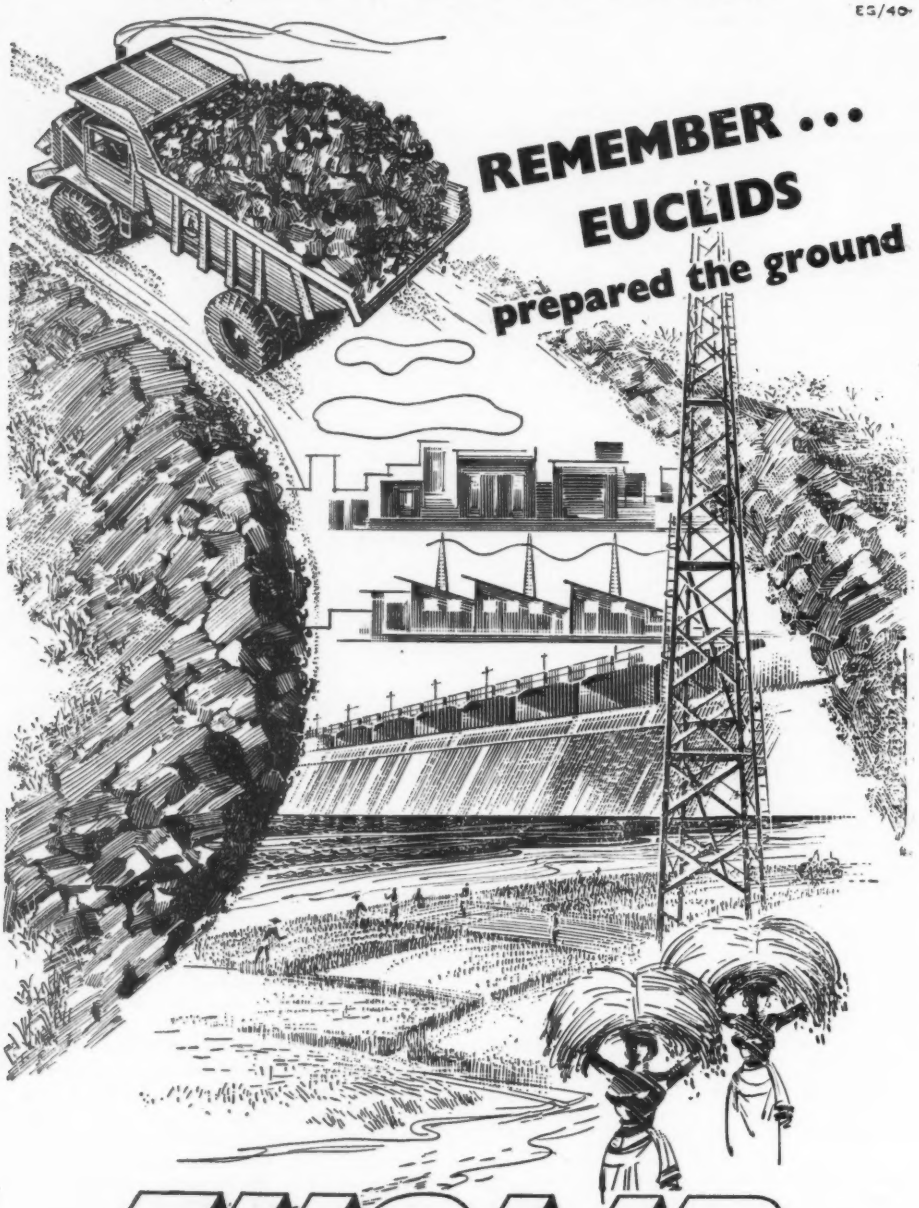

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Floods of 1956

By

G. L. NANDA

Minister for Irrigation and Power, Government of India

AUTHOR

On July, 27 1956 the Minister for Irrigation and Power laid an exhaustive Statement on the Flood Situation and the Flood Control Programme before the Lok Sabha and while doing so he supplemented it by a speech, a summary of which is given below. It gives the essential facts of the flood situation as also of the progress of protective measures.

The floods have so far affected an area of roughly 2,500 square miles in Assam, Bihar, U.P., West Bengal, Punjab and Saurashtra. 70 persons have lost their lives as a result of the floods.

Damage to crops and other property has amounted to about Rs. 9 crores.

I may acquaint the House regarding the developments and the existing situation in various parts of the country on the basis of the latest reports.

Punjab :

During the first week of July there were heavy rains in Ambala District. As a result the Markanda, Saraswati and other small tributaries of the Ghaggar system were in spate. These caused some damage to the Narwana branch and its distributaries. Fortunately the level of the streams fell quickly and the damage was not much.

Only on 24th. July last the Ravi rose to a high level at Madhopur, the discharge being, 2,33,000 cusecs. Timely warning was given to the people and there was, therefore, no loss of life. There was also no damage to property and other works. The river has since fallen and is now below 36,000 cusecs.

Bengal :

This year there have been no high floods so far.

Tripura :

During the night 2nd/3rd June, 1955, there was an unexpected rise in the rivers Haora and Gomti and the waters over-toppped the flood embankments and entered Agartala. The town remained inundated for 2 days and at places the depth was as much as 5 feet which submerged all the roads. Most of the mud houses which were directly in the way of the on-rushing waters collapsed and were washed away. away. The embankments have already been repaired and are now being raised above the flood level. At present the rivers are running low.

Jammu and Kashmir :

This State has been free from floods till recently when there were heavy rains in the Jammu province, and as a result Ujh and Basantar streams were in floods yesterday. They have caused some damage to Basantar and Ujh protection works.

Assam :

In Assam the Brahamputra floods did not submerge any part of Dibrugarh though the water level in May, 1956, was very near the highest ever recorded. The Umtru river had a discharge of 65,000 cusecs on the 5th of June which is the highest in living memory. The State has largely remained free from floods.

The yesterday's gauge at Dibrugarh was 2 feet below the danger level. Recently there were some heavy rains again in Assam, and as a result the Burhi Dehang and other rivers are slowly rising. About 5 miles of Lahoal-Bordubi-Tinsukia road is under water, but so far no damage to works is reported.

Andhra :

The Krishna is in farily high floods but the bunds along the river are holding on well. Some of the islands in the river have been partly submerged. The people were shifted in time.

A part of Vijwada town is situated between the river Krishna and the bunds constructed along this river. This part was inundated but the people were shifted to safer places.

In North Andhra, the Nagavalli and Vamsadhra rivers in Srikakalum district, which were in floods in the first week of July, are reported to be falling now.

Bihar :

This year the Kosi river rose earlier than usual. During the first week of May, the Kosi waters entered a few villages like Tardiha and Matras just inside the western embankments. The river rose to over one lakh cusecs as early as on the 17th of June, 1956. Although the embankments stood well, the marginal bund at Tiljuga was cut by the villagers of Rajpur to drain off the waters. In July, however, the river was not as high as usual, the maximum being only 1,45,000 cusecs on the 22nd of July. The discharge on 26th was 1,01,000 cusecs. The embankments constructed so far are standing well.

The Bagmati rose above its danger level on several occasions in this season. Some areas were inundated but the damage was not much. On the 26th July, 1956, it just crossed the danager level again.

Although the Burhi Gandak rose to danger level

earlier than usual, because of the protective works there has been no inundation of the area. The Samastipur town is so far quite safe. The gauge of Burhi Gandak on 26th. was just below danger level.

Uttar Pradesh :

The floods in Uttar Pradesh usually occur in eastern districts, but this year during the first week of July there was heavy rainfall in the western districts. This affected Muzaffarnagar, Saharanpur, Ghaziabad and Meerut Districts. The rainfall at Muzaffarnagar on the 1st and 2nd of July was about 30 inches which is nearly equal to the year's total rainfall. A large number of houses collapsed and 120 sq. miles of area was affected. There were breaches in rail track and roads and the traffic between Delhi-Saharanpur was suspended. The Hindon which is a tributary of the Yamuna was 3.5 ft. above the danger level and 1 ft. below the maximum ever recorded in 1924.

At present there are no floods in Uttar Pradesh and the damage caused has been practically repaired.

Delhi :

This year the Yamuna rose earlier than usual. But the construction of Shahdara embankment which is almost complete saved the concerned area from inundation. At present the river is fairly low.

Flood Season not yet over

The flood season usually extends up to the end of August and we have, therefore, to remain watchful for another period of a month or more. Taking the country as a whole, the major rivers have not yet flooded any large tracts. Careful vigil is being kept on most of the country's problem rivers and on the works already executed. Arrangements have also been made for prompt dissemination of correct flood news, to secure the maintenance of works and to prevent unnecessary alarm arising out of wrong information. Daily news letters on the flood situation and a weekly review are being circulated to the Press and the Members of Parliament. It is a matter for deep gratification that all the flood control works constructed in Assam, Bihar, Uttar Pradesh and West Bengal have stood up well and are protecting large areas. I may mention, in that connection, the spurs, dykes and embankments constructed for the protection of Dibrugarh in Assam ; Jalpaiguri, Alipur, Duar, Coochbehar, Matha-Bhanga and Toofan Ganj towns in West Bengal ; Samastipur town and areas adjoining the Kosi to North Bihar; and the Chitawni bund along the river Gandak in Uttar Pradesh.

The floods made their appearance this year earlier than usual. We started receiving reports about inundations in the middle of May. Normally this happens towards the end of the first week of June. A remarkable feature of floods this year as well as the previous year was that areas which had remained practically immune for many years past were visited by floods of exceptional intensity thus taking the people by surprise-in a state of unpreparedness. In 1954, the mischief was confined to major rivers. In 1955 and 1956, however, intensive rainfall over local areas caused smaller rivers such as Gomti, Tons and the Hindon to go into spate. This unpredictable character of floods has to be borne in mind and although it is not possible to complete protective works simultaneously or in a short time all over the country, the hazards and the damage can be greatly reduced if precautionary measures are taken and an organisation ready to cope with an emergency is set up and kept intact, for all these areas. This requirement is now being kept increasingly in view.

This year's floods have reinforced the lessons of last year's experience that man made obstructions placed in the way of the direction of the flow of surplus waters create problems of drainage and accentuate flood risks specially in flat areas like the Ganga basin. This aspect of the problem is now receiving earnest attention. Remedial action has to proceed on the basis of a close study of local conditions and obstructions in order that we may plan efficient discharge systems including channel improvement.

Unified Control

It has become clear that we have got to further increase the efficiency of our organisation by adopting unified control of all flood control works in the States. At present, protection works such as road embankments, railway embankments, private bunds, etc., are under the administrative control of different departments of the State Governments resulting in a division of responsibility for maintenance and supervision thus leading to uncoordinated action. The necessity for unified control has been brought to the notice of the States through the Central Flood Control Board. We have also to link up the flood control and relief organisations in the States for more effective action. We are also exploring how best we can utilize the Community Project Administration in the construction of flood protection works.

First Phase completed

The question has been raised how far we have fulfilled the promise given nearly two years ago that the problems of floods will be tackled on war footing. We are also being asked how is it that, in spite of our programmes, the floods are still coming.

The House will recall that following the disastrous floods of 1954 the Central Government took the initiative in deciding to handle the problem of floods on a national basis.

Prior to this practically no attention had been paid to the means and methods for affording protection to flood affected areas. No atttempt had been made to collect basic technical data which alone would have enabled the preparation of sound flood protection schemes. On 3rd September, 1954, I made a Statement in this House setting out the magnitude and character of the problem of floods in the country. I placed before Parliament a comprehensive flood control programme estimated to cost Rs. 175 crores and covering a period of 10-12 years. This programme was divided into three phases : immediate, short-term, and long-term. The first phase, it was then stated, would extend over a period of two years and would be devoted to intensive investigations and collection of data besides the execution of some emergent works. This period of two years will end in about a month. It may be claimed that what has been accomplished in relation to these objectives in this brief period is a story of remarkable achievement. In the matter of investigations the work compressed within these two years might have

ordinarily taken three to four times this period. 43,000 square miles of aerial photography has been completed in addition to 16,000 square miles of tertiary levelling against the target of 43,400 and 18,100 square miles respectively. *Big strides have been made in the matter of hydrological observations.* There were practically no silt observations prior to 1941 in many of the major river systems. Rain-gauge stations were few. There were only about 800 discharge stations in the country's entire river system. We have since 1954 been able to set up as many as 32 silt observation stations on the Brahmaputra and its tributaries, 59 rain-gauge stations and 281 additional gauge discharge stations.

The investigation organizations at the Centre and in the States were geared up so that as many as 69 major schemes have been investigated and submitted for sanction by the various States.

So far as construction is concerned—important local town protection works have been completed, the level of 1400 village sites has been raised and more than a thousand miles of embankments have been prepared. This represents a quantum of work not done in the past in the course of many years. Implementation of these emergent schemes has given protection to an area of 4,800 square miles in Uttar Pradesh, Bihar, West Bengal and Assam with a population of approximately 50 lakhs.

Advance has been made in research and experiment also. We have employed extensive hydraulic model tests in connection with the flood problem. Work models on a scale for larger than ever attempted in the country have been set up for Dibrugarh, Kosi and other works. In the matter of designs for projects on some of our difficult rivers the work of our engineers has been eminently successful. Dibrugarh, Kosi and other similar works bear testimony to this. We have have not hesitated to secure all possible information on the latest practices obtaining in various countries and to draw upon the experience gained by them in this field. It was imperative that we should carry out investigations, preparation of projects and actual construction with the utmost speed in order to make make up for the time lost prior to 1954. We have endeavoured to do this. The scale of intense and coordinated effort that was involved, for example, in the completion of the protective works for Dibrugarh in the record period of a single season and the rich reward it has brought are memories to cherish. A couple of months ago, a party of press correspondents representing leading newspapers and news-agencies visited the flood control works in U.P., Bihar, West Bengal and Assam. The articles which appeared as a result of the visit reflect the marked appreciation of the work that has been done and the relief and sense of security that are being experienced now by large numbers of people in those areas. The people's co-operation in the execution of several hundred miles of embankment has been spoken of in highly appreciative terms and the hope has been expressed that work on these lines will be extended to other projects. The striking success of the experiment in large-scale people's participation on the Kosi Project has attracted a great deal of attention.

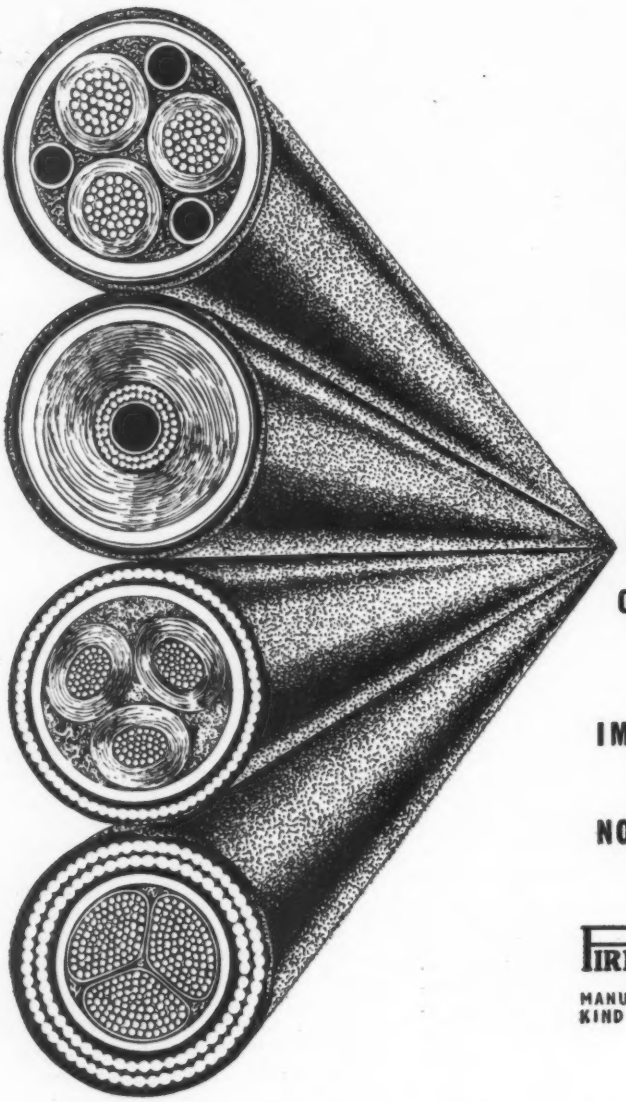
No Schemes rejected

The tempo of work on the flood protection programme has been increasing. During the first year, i.e. 1954-55, we could spend only about Rs. 2.4 crores. In 1955-56, the expenditure was stepped up to Rs. 8.4 crores. *No scheme which the States have sent for sanction has been rejected provided it was technically sound.* To all the States the Centre has given the fullest help in investigations and designs and determining the different phases of construction.

For the current financial year the provision of Rs. 5 corres has been made in the Central Budget for rendering assistance to the States for their flood control schemes. There is an apprehension that the execution of flood protection works may suffer due to lack of funds. I have conveyed to the States concerned that this provision may be increased. I may assure the House that *lack of funds will not be allowed to stand in the way of the execution of the schemes* in the States during the year, if they are sound and feasible. In regard to the Second Five Year Plan period, the draft plan for Rs. 117 crores was discussed in the House in September, 1955. In the context of the available reasources and other developmental activities in the country, allocation for floods could not be made larger than Rs. 60 crores. It is not necessary however to spread the expenditure over the entire period of the Plan. When we take into account the heavy economic and other loss caused by the floods, and the cost of relief, the benefits of flood protection would multiply in proportion to the promptness with which it is carried out. I am, therefore, prepared to recommend that the *amount allotted under the Second Plan may be spent in the first three years* provided the States are able to expedite the execution of the schemes and increase their capacity for this purpose.

I may point out that the various schemes that have been executed or are shortly to be taken up are not separate individual schemes but have been so conceived as to dovetail into a comprehensive plan of flood control. Unless we have integrated and well-thought-out plans, it is possible that complications may arise and we may not achieve the full measure of flood protection in an economical and efficient manner. A comprehensive plan, however, depends on the availability of the requisite data. The accelerated work done in this regard during the last two years has given us sufficient information to make a start on these comprehensive plans. This work of collection has not yet been completed. Every river system will be carefully studied and a comprehensive plan drawn up so that flood control and other aspects of development can be integrated to draw up the maximum benefit from each river system. A comprehensive plan may involve construction of reservoirs for control of floods, which will have to be undertaken at differnt stages.

In the end I may point out humbly that while a progressively increasing measure of protection from floods would be achieved each year we cannot expect for years to come to be in the fortunate position of being absolutely immune from flood risks. *We shall have to learn to live with the floods to an extent.* In a country like the United States which has invested roughly 5,000 million dollars in an attempt to ward off floods, ravages from this source still occur and only last year there were two floods in that country which were reported to have caused damage of the order of 600 million dollars and loss of 279 human lives. We shall, however, be able to curb and confine the floods more and more and do all that is possible to save ourselves from the harm and the devastation that they bring.



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Madras Plant Extension —Stage III

By

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AUTHOR

The first public electric supply undertaking in the State of Madras was the Madras Electric Supply Corporation who commenced operation in 1909 under a licence. The undertaking was taken over by Government on 29th August 1947 when their licence expired. At the time of taking over, their main power station at Basin Bridge comprised of nine boilers with a total capacity of 3,20,000 lbs. per hour and six turbo alternator sets of total installed capacity 41,500 KW. The capacity of indivudal boilers varied from 15,000 lbs. per hour for the oldest boiler to 60,000 lbs/hour for the latest unit. Similarly the capacity of the generators varied from 1,500 KW for the oldest unit to 15,000 KW for the later unit. The steam conditions were 200 lbs. per sq. inch. pressure and 600°F temperature.

Owing to the long service put in by the boilers and generators, most of them could only generate much less than their rated capacity. As a result, even before a few years prior to the undertaking being taken over by the Government, the power station was fully loaded up and the power development in the city had to be severely curtailed.

With a view to give immediate relief to the power position in the city, the Government commissioned a new steam station ('C' Station) in 1948 with two transportable sets each of 2,500 KW. capacity with steam obtained from oil-fired boilers.

For long range provision, the Government sanctioned even in 1945, the erection of a new power station, ("B" station), adjacent to the old "A" Station, with 2 Nos. 15,000 KW turbo-sets and 5 Nos. 80,000 lbs/hour boilers in two stages. The expansion of the power station by a third stage of development to augment the installed capacity by another 30,000 KW was contemplated even at that time but details were left to be decided later.

In 1953, Government sanctioned the third stage development involving the addition of two 15,000 KW turbosets or one 30,000 KW. turboset with two 150,000 lbs/hour boilers. The Madras Thermal Station was connected to the Madras Grid in 1950 by the Singarappet-Villivakkam 110 KV line. This interconnection has proved its efficacy time and again enabling export of power from Madras to the hydro-areas in periods of water shortage and import of power from hydro-stations when surplus water in hydro systems permitted such a transfer.

Progress under the first two stages of Extensions at Basin Bridge Power Station

Work on the first stage extensions was taken up in 1948 with M/s. Merz & Mclellan (India) as Consulting Engineers and the first 15,000 KW turboset with three 80,000 lbs/hour boilers came into operation in 1953. The steam conditions for the new station are 400 lbs. per sq. inch. pressure and 750°F temperature at the turbine stop valve. The turboset was manufactured and erected by M/s. English Electric Company and the boilers by M/s. Babcock and Willcox of India Ltd. Two 15,000 gals per minute capacity natural draught cooling towers were erected for increasing capacity of the C.W. system to meet the additional demand for cooling water.

Under the 2nd stage extensions, repeat orders were placed for one more 15,000 KW turboset and two 80,000 lbs/hour boilers with the same steam conditions as the first stage and all equipments have been received and erected except one 80,000 lbs/hour boiler. The 15,000 KW set and one of the two 80,000 lbs/hour boilers were commissioned in January 1954. The second boiler is expected to be commissioned by the end of 1956. The second stage work being carried out direct by the Department without the aid of Consulting Engineers.

Third Stage Extensions—General

The third stage extensions was sanctioned in 1953 and contemplates an additional generating capacity of 30,000 KW. The question of ordering a single 30,000 KW. set or 2 sets of 15,000 KW capacity each was examined by the Department as also the question of adopting the same steam conditions as for 1st and 2nd stage or having higher pressure and superheat temperature for steam. Tenders were called for both alternatives of sizes and steam conditions and it was decided, after taking the economical and technical factors into account, to order one 30,000 KW Turbo-set and to adopt higher pressure and temperature for the steam viz. 850 lbs/sq. inch pressure and 900°F at the Turbine stop valve.

The cost of the third stage extensions alone works out to Rs. 437.40 lakhs including distribution, of which the cost of the generation plant comes to Rs. 261.24 lakhs. The total cost of the whole scheme of Madras Plant Extensions for the 1st, 2nd and 3rd Stages is Rs. 955.77 lakhs and is expected to bring a net return of 4.21% at the end of 10 years after meet-

ing all operation and maintenance charges and depreciation.

Boiler plant

The boiler plant ordered will comprise two steam boilers of Steinmuller (German) make, with a rated out put of 1,50,000 lbs. per hour each (Maximum continuous rating) at 900 lbs. per sq. inch and 925°F at the super heater outlet. The two boilers are intended to supply steam to one 30, 000 KW turbo set designed to work at a pressure of 850 lbs/sq. inch and temperature of 900°F at the turbine stop valve. The boilers have been designed to burn efficiently a wide variety of fuels i.e. all Indian coals, South Arcot lignite char, lignite oil as well as furnace oil.

The boilders will be of the Steinmuller's Radiant type for pulverising fuel firing and each of them will be provided three nozzle type burners. The mills, burners and interconnecting piping will be installed in such a manner as to obtain and ensure even distribution of pulverised fuel and even flame over the entire width of the boiler even at times when only one mill and three burners may be in operation.

Air supply for combustion will be provided by forced draught fans. The air heaters to be provided will be of pocket air heater type.

The existing Coal and Ash conveyor systems of the 'B' Station will be extended to cover the new boilers. Each coal bunker will have a capacity of 350 tons and will be provided with three outlets to feed the three mills.

The Boiler feed water will be provided by pumps each of capacity 330,000 lbs/hour, two of them being electrofeed pumps and the third a steam turbo-feed pump.

Turbo-set

The turbine will be of A.E.G. (German) make, of the single cylinder, impulse type with 16 stages and rated to give its full output of 30,000 KW MCR at 0.85 power factor at a normal steam pressure of 850 lbs/sq. inch and temperature of 900°F at the turbine stop valve, with a cooling water temperature of 85°F and running at a speed of 3000 RPM. The condensing plant comprises a counter flow type surface condenser, split type, with 4630 brass tubes made of special brass, 3/4" dia by 18 S.W.G. The alternator is rated to give an output of 35,300 KVA at ·85 PF at 3000 RPM, generating at 11 KV. The alternator is self-ventilating with closed circuit systems and air cooler for a water temperature of 95°F. The alternator will have its exciter directly coupled to it. The new 30 MW turboset will operate in parallel with the existing 15 MW English Electric Co MW turbo sets as well as with the grid.

Swtichgear and Cables

Extensions to the existing 11 KV 750 MVA. 11 KV 250 MVA switchear as well as L.T. switchgear to suit the 30 MW additional plant have been ordered with E.E. Co., Madras.

The necessary power and control cables have been ordered with G.E.C. of India, Madras.

Circulating Water System

The three pumps for the circulating water system at the turbine house will be of the axial flow type. Two of them have a discharge capacity of 11,000 gallons per minute each and will normally be used in conjunction with the 30 MW turbo-set. The third pump which would be a common spare for the new station as well as the CW pumps in the "B" station has a motor with 2 windings and will deliver 11,000 gallons per minute when running at the low speed and 15,000 gallons per minute when running at the higher speed.

The pumps for the circulating water system at the cooling tower will be of the centrifugal type with auxiliary split casing and vertical spindle, suitable for being driven by vertical motors at the pump floor. These two pumps are rated at a capacity of 15,000 gallons per minute.

There will be two induced draught cooling towers with two cells in each, completely in timber of capacity 9 lakh gallons per hour per tower. The internal dimensions are 80′ by 40′ for each unit and the height from rim level of pond to the top of the tower is 50 ft. The tower will cool 18 lakh gallons of water per hour from 97°F to 85°F when the dry bulb temperature is 85°F and the relative humidity is 63%.

The draught of air is created by eight I.D. fans driven by motors of 30 H.P. capacity each in either tower.

Progress of the III Stage Extension

The location of the new 'B' Station for accommodating the three stages of the Madras Plant Extension is adjacent to the existing 'A' Station. Due to the restricted spare available, all the generating equipments under the III Stage have to be located inside the 'A' Station after dismantling and removing the old generating plant and boilers. The foundation piling work for the new station is in progress.

One of the old suction goits, which was fouling the III Stage area has also been re-routed.

The delivery and completion of the entire plant and equipments are guaranteed under penalty. The new 30 MW Turbo-set is expected to be commissioned in September 1957.

SHARING WATERS OF TUNGABHADRA

An inter-State conference on sharing the waters of the Tungabhadra high-level canal which will be made available for irrigation in Bellary, Ananthapur and Cuddapah Districts, was held recently.

The two State Governments agreed that Andhra should receive 65% share of high-level canal waters and Mysore 35%. The meeting also decided that all common works of the project should be executed by the Tungabhadra Board. The canal and its distribution channels, which are for the exclusive use of areas in the two States, will be constructed by the respective State irrigation departments.

It is expected that the decision will help accelerate the progress of the Tungabhadra high-level scheme which on completion would irrigate over 300,000, acres of land.

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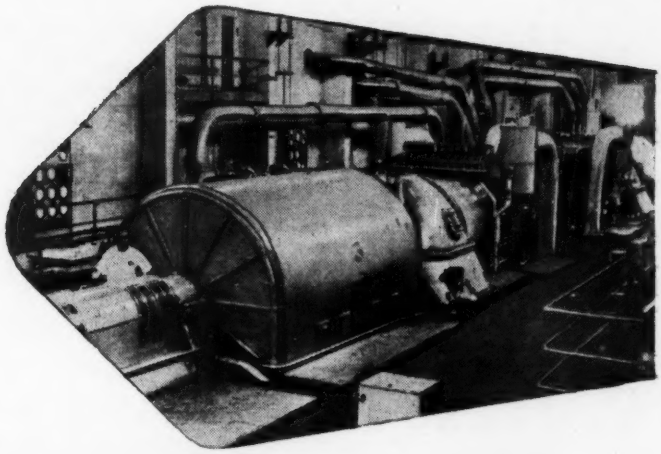

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Greater Calcutta	1,61,000 KW
Madras (Basin Bridge), Pykara, Mettur, Papanasam and Moyar	2,15,450 KW
Mysore (Jog)	48,000 KW
Travancore	22,500 KW
U. P. (Harduagang), Bahadrabad, Bhola, Sumera & Muhammadpur	40,600 KW
Bhakra dam	500,000 KVA

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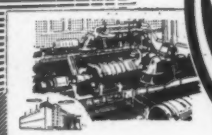
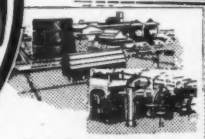


Bokaro Thermal Station.



Sindri Fertilizer Factory.

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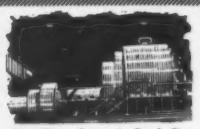

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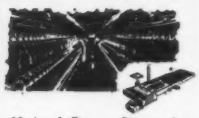
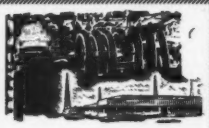


National Rayon Corporation, Kalyan.



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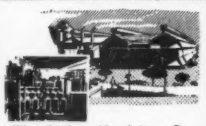

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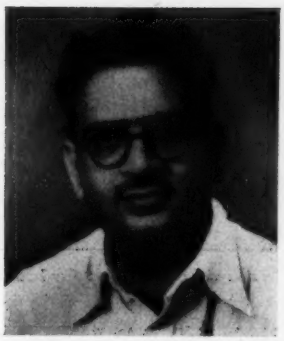
Colombo Session of Central Board of Irrigation & Power

By

BALESHWAR NATH, B.Sc., C.E. (Hons), M.I.E. (India).



AUTHOR

While inaugurating the 26th Annual Research Session of the Central Board of Irrigation and Power at Colombo on July 24, 1956, Mr. S. W. R. D. Bandaranaike, Prime Minister of Ceylon, observed, "The future of our country— an economy of a few primary agricultural products exported from the country and a country, which is being utilised chiefly for the prupose of consuming manufactured articles and goods from abroad—depends upon more intensive cultivation, more extensive cultivation and greater diversity of agiculture so that a more stable economy may result".

"You are dealing with one of the most important matters effecting the progress and success of our Asian countries— irrigation and power. In the first place, our countries will doubtless continue to be primarily agricultural countries. I am in no way depreciating the vital importance of increasing the industrial production. There are some Asian countries that can do so. But to a great extent, the rest of us will continue for some time to be agricultural countries. Therefore, irrigation, hydrology and the various researches, you are engaged on, are extremely important. I have no doubt that your deliberations and particularly of your Research Committee, will be of a great value in this connection..... There is a great deal to be done in our country, and I hope that your presence here will have quickening effect in helping us to attain the knowledge and skill necessary for our development". Very rightly, indeed, the Prime Minister of Ceylon has indicated our dependence in the Asian countries on development of our agriculture, and *inter-alia* on our irrigation and power development on which agriculture depends. He also opined that these countries could neither proceed on the orthodox capitalistic lines, nor adopt the Marxists way and need must follow the middle course adopted by India, of developing their economy on a pattern based on a democratic socialist way of life.

Technical Discussion

Technical discussions that continued for four days after the inauguration, covered a vast field of subjects ranging from minor irrigation schemes to the construction of extensive multipurpose projects, and and from the problems of conservation of water in the minutest feeder-channels to the question of creating artificial rain, as also the problems pertaining to the execution and operation of Hydro-electric projects and construction of rural transmission network. The team of Indian engineers who took part in the deliberations, included the Chairman and Member of the Central Water and Power Commission, Chief Engineers of many States, representatives of State Electricity Boards and the Directors of Central Water and Power Commission and of different Research Stations from all over India. They were accompanied by many research officers and field engineers engaged on actual operations of projects. A large contingent of Ceylon Engineers attended the Session and actively participated in the discussions.

The delegates were welcomed on the afternoon of the inauguration day by His Excellency the Governor General of Ceylon, and were entertained to a garden party in the spacious lawns of Queens House.

The gathering there included Diplomats from different countries of the world and almost all the the Cabinet Ministers of Ceylon Government. His Excellency himself was seen moving among the delegates, and there was an atmosphere of cordiality and hospitality very rarely witnessed in such formal functions. It afforded an unique opportunity to Indian Engineers to enlighten the representatives of different countries in respect of the techinque and progress on the various schemes and projects included in our Five Year Plans and under operation in the different parts of the Sub-Continent. In fact, the party imparted due weightage and importance to the Session, and invoked interest in many a subject which subsequently came up for technical discussions during the business of the Session.

Most advantageous principles

About 50 papers were presented on various subjects, which included River Control, Design of Dams and Weirs, Investigation of Hydraulic Structures on Permeable Foundations, Rainfall and Runoff, River Behaviour and Flood Control, Measurement of Flowing Water, Regeneration and Losses, Soil

Indian Engineers at Ceylon Irrigation Research Station, Colombo

Mechanics, Water Requirements of Crops, Use of Surkhi as Puzzolana, Design of Electrical Transmission Lines and Problems of Rural Electrification. While discussing the question of flood protective works done at Dibrugarh Town and the effect of flood embankment at Kosi River, Shri Kanwar Sain gave an interesting account of the history of the works and further development that have taken place. Training of River Ganga at Kashi evinced great interest among the members. Use of puzzolana (brick surkhi) in cement mortar being a matter of great economic consequence on the construction programme, was discussed at length by the Research Officers. Interest also centred on the question of transmission poles for electrification of rural areas. As timber poles have not been proved to be satisfactory, Shri U. N. Mahida, Chief Engineer of Bombay informed the House that pre-stressed reinforced concrete poles have been designed and built in Bombay State, and they could economically compete with other types of transmission poles and afford workability of a high order. Rainfall and runoff studies of different rivers were presented by Research Officers and lively discussion took place on different features of such studies. A symposium was also organised on "Various Methods of Designing Spillway Capacity of Dams and estimating Flood Discharges". The trend of discussions was all along a healthy mutual exchange of ideas, in a contributary spirit, with the set purpose of evolving the most advantageous principles for the design, execution and operation of different irrigation and power projects, with particular reference to our requirements in the tropical regions of South East Asia. The technical discussions concluded with an informative talk given by Mr. D. W. R. Kahawita, Senior Designs and Research Engineer, Ceylon, on the Development of Irrigation in Ceylon.

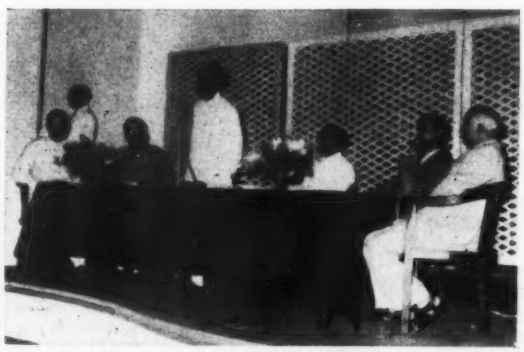
The Engineering Association of Ceylon were hosts to the delegates at a Tea Party in the Grand Oriental Hotel on July 26, 1956. This function was attended by the Diplomatic Corps, and as also by a good cross-section of the gentry of Colombo. Towards the end of the party, a cultural show was presented by Pani Bharatha. The programme included various folk dances, namely Mangalan, Pantheru, Gajaga Vannama, Ves and Bathe Upatha. The last dance i.e. Bathe Upatha was the most interesting and depicted the birth of rice. It surveyed the processes involved in the production of paddy, from the tilling of the soil to the finale of relaxation and enjoyment of the workers at the end of a season's labour. It was interesting, indeed, to get acquainted with the cultural aspects of Ceylon's life so depicted in the various folk dances presented in the programme. On the following day the delegates were entertained to party at the residence of the High Commissioner for India.

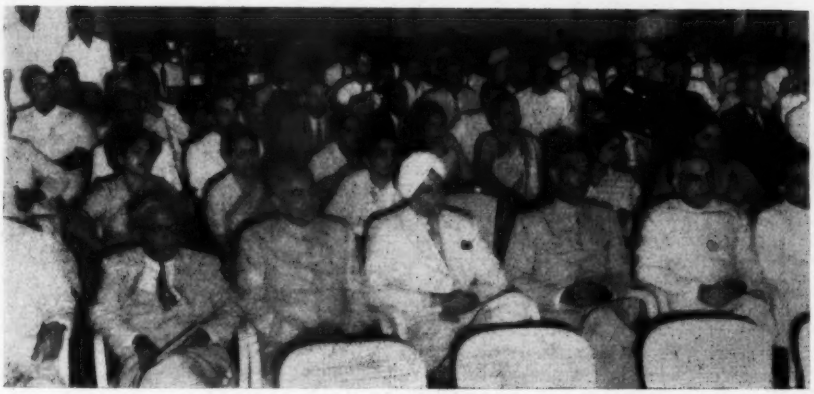
Mutual Aid and Service

The Minister for Lands and Land Development, the Hon'ble Mr. C. P. de Silva, a man of rare abilities, knowledgable disposition and intensely interested in the agricultural and irrigation development of his country, called the delegates to a tea party and discussed with many of them, his local problems of administration and execution of irrigation and power projects. The discussion seemed to reveal that answers to many a problem of Ceylon could be rightly found in the working plans of different multipurpose projects in operation and under execution in the Indian Sub-Continent. In fact, India could contribute considerably and render technical aid more profitably than the western world towards development of its neighbouring countries in South East Asia. Colombo Session of the Central Board of Irrigation and Power, therefore is a landmark in the history of the Board. It indicated very clearly, how India can expand its sphere of mutual aid and service not only culturally, but technically in its neighbouring countries, who can profit more by experience gained next door than by the experience acquired thousands of miles away in the western world, under a different economic and social pattern and under varying climatic and topographic conditions.

The Minister for Burma in Ceylon Mr. Ba Lwin, a singular example of hospitality and cordiality, was keen to meet the Indian delegates, more particularly because Burma has a common field of activity with India in respect of development of her natural resources. He held a reception to meet Indian and Ceylon Engineers at his own residence. At this occasion, he also showed a film of how different developmental activities are progressing in Burma and how Burma's requirements ran parallel to those of India and other eastern countries. He expressed a desire for a closer collaboration in the technical sphere between Burma and India. With an administrative pattern almost similar to that of India and with the common background history and a common problem of converting a colonial economy into an economy of a free country, active collaboration in all fields of human activities

Prime Minister of Ceylon addressing C. B. I. and P.





A view of C. B. I. and P. Session at Colombo

between different countries of South East Asia seems essential. It has also to be realised that the problem of power development for these countries was also a problem of time. There is no leisure to strive slowly and laboriously. When according to a conservative estimate of the past generation, a task that took 50 years for completion needs must be attained now within a span of 5-10 years ; otherwise history and events will overtake us, and we may not be able to attain the stability, which is required for building up a sound economy. Steps to acquire expediency at any cost have also to be examined judiciously. We have to work up our schemes in a manner so as to enable us to stand on our own feet, with ever decreasing dependence on the western powers.

Radio Broadcast

Indian Engineers' presence in Ceylon was welcome in all quarters. Radio Ceylon too, took advantage of it. Shri Kanwar Sain, Chairman, Central Water and Power Commission, Government of India, was requested by Radio Ceylon to give a radio talk on the development of Irrigation and Power in India. Later, a dialogue between Ceylon and Indian Engineers was broadcast by Radio Ceylon. It covered a vast field of development activities in the field of of Irrigation and Power. Those who participated in the dialogue included Shri U.N. Mahida, Chief Engineer, Bombay, Shri Yadava Mohan, Chief of Natural Resources, Planning Commission, New Delhi, Shri B. S. Nag, Cheif Engineer, Assam and Shri Baleshwar Nath, Secretary, Central Board of Irrigation and Power, New Delhi from India and Mr. A. E. C. de S. Gunasekhara, Director of Irrigation and Mr. D. W. R. Kahawita, Senior Designs and Research Engineer from Ceylon.

During their stay in Colombo, the delegates were shown Engineering works in Colombo Harbour and and paid a visit to the Irrigation Research Institute there. The tours that followed covered a good cross-section of the country. Ceylon is a small country wholly within the Tropic of Cancer. The greatest length of island from north to south from Palmyra to Dondra Head is 270 milles and its greatest width from Colombo on the west to Sangaman Kanda on the East is 140 miles. Roughly 1/6th of the total surface area of the island is mountaneous, while about 335 sq. miles is covered by inland waters. The island consists of a Central Massif of hill country sloping on all sides from the Pidurutalagala peak about 8,300 feet above the sea. The tour was so organised as to give the delegates an idea of the topographical features of the country and covered partly Kandyan hilly tracts and partly the drier level land on the east. The first tour took the delegates across the hill tracts to Polonnaruwa, then to Gal-Oya scheme on the eastern coast and back to Colombo via Nuwara Eliya and Kandy. The delegates were able to see the different reservoirs existing in Ceylon for thousands of years, and being reconditioned and restored now, as also many minor irrigation schemes. The Gal-Oya Scheme itself is a multipurpose project and consists of a rolled earth-fill dam with a crest length of 0·75 mile and maximum height from foundation to top 154 feet high. It has been built across Gal-Oya River about 40 miles downstream from its source. Its construction reduces flood hazzards in in Puttipolia Aar basin and is expected to provide irrigation facilities to about 1,20,000 acres against the uncertain possibilities before of only 25,000 acres. The reservoir covers an area of 30 sq. miles and stores 7,70,000 acre feet of water. The water flowing down for irrigation will also generate hydro-electric power to an extent of about 10,000 killowatts.

Artificial Lakes

The second tour took the delegates to Anuradhpura, where, besides monumental remains of a civilization 2000 years old interspersed by many a gigantic dagoba, they saw the artificial lakes of Tissawewa and Nuwarewewa. During the times of early Singhalese Kings large tanks were built with a net work of canals and distributaries and the delegates were pleased to see such old irrigation works existing, though most of them had fallen in ruins during foreign occupation of the island. An active programme for restoration, extension and improvement of old irrigation works is being pursued now. From Anuradhpura the delegates proceeded to Kandy after visiting Polonnarwa and Sigiriya and returned to Colombo via Nuwara Eliya.

Another tour was organised for the electrical works. Most important of these works is Laksapana scheme, the first Hydro-electric project of Ceylon Government, which came into operation in 1950. As its name suggests, it is a center of one hundred thousand lights. Generating capacity of this station is about 25000 killowatts. It utilises the difference in level of two

adjacent rivers, namely the Kohelgumaganga and the Maskeliya Oya. Head available is about 1500 feet. A picturesque dam 113 feet high bars the Kohelguma-ganga at Norton bridge, and creates a a lake with storage capacity of 686.4 acre feet. As the storage is unable to overcome seasonal variations, another reservoir is under construction at Castlereagh about 4 miles upstream of Norton Bridge. The dam at this side will be 130 feet high and will have a storage capacity of 45,900 acre feet. On completion of the second stage scheme, third and fourth stage of the work will be taken up leading to a total power development in this valley to a tune of 150,000 killowatts. The country round about is all under tea plantation, and presents a glorious setting for development activities. It is a pleasant drive across this panoramic land, where water-falls, one or the other, are always in view and then glistening white foam adds splendeur to to the green scenic background of the terraced tea-fields, interspersed with thick tropical foliage. What could be more enchanting to the eyes? Truly, if Ravan's legendary Lanka of gold was here, it is no wonder.

While going across the country, the delegates were greatly impressed with the cultural affinity that exists between Ceylon and India. Nearly all big rivers in Ceylon are called Ganga, and there are very many common words of Sanskrit origin in Singhalese language. Buddhisim as practiced in Ceylon, has a distinct sprinkling of Hindu mythology, and even idols of the trinity exist in many Buddhist temples. In the technical field too, there is much in common between Ceylon and India. Irrigation pattern of the land resembles that of South India. This Research Session of the Central Board of Irrigation and Power, was therefore, of great educative value to Ceylon Engineers, particularly the younger ones, who could not otherwise, partake in deliberation at that technical level, and who were enabled to appreciate the intricate technicalities involved in the development of the natural resources of the country and how problems of that nature are being tackled in India. The Session was a phenomenal success, in all respects. Members of the Board and their Research Officers therefore felt greatly gratified after holding their deliberations in a fraternal atmosphere of mutual exchange of information and ideas, which could be of so much use to a neighbouring member State.

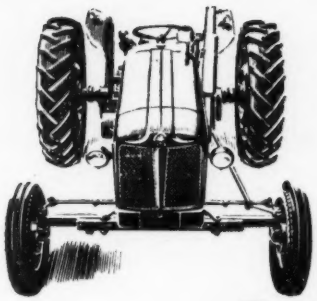
(*Continued from page* 5)

Planning a New Industrial Culture

cooperative service center each little industry could have advisory services on a par with those available to big centralized industries. The industries would own the center, rather than the center own the several industries.

Such centers for special services have been particularly successful in the Scandinavian countries. In Finland, for instance, several fields—tanning, metal work, and others—have such central services. Among small metal industries, for instance, some hundreds of small Finnish industries, many of them with only about a dozen workers, have set up a central service organization. The services are paid for by charging a small percentage of the sales of each company. This service center takes care of export and import licenses for the members. It buys raw materials and helps to sell the products. Its research engineers plan new machines and new processes needed by small industry members. They help work out labor problems. If a small member industry needs to borrow money at a bank, the center can report accurately the need and responsibility of the little firm, and the banks have come to accept the opinion of the center. In such ways a little industry, with perhaps only a dozen or twenty workers, can get as good special services as a great industry. The little industries own the center. The center does not own them.

By such a general process India could proceed toward modern industrialization without mass centralization, and without disrupting the structure of village and town life. In the process India might get the advantages of modern technology without taking over the pattern of the private profits motive of private industry and without the communities being submerged by totalitarian dictatorship from above. Such a program could start on a modest scale, and could grow out of itself. It might have many similar starts in many localities, which would provide a broader democratic base and provide more laboratories for development. Much industrialization need not be centralized, and need not be dominated either by private capitalist dictators or by totalitarian socialist dictatorship. Quite commonly it would be well to start such undertakings in areas where electric power is available, though there are many possible small industries for which the power demand would be very small.



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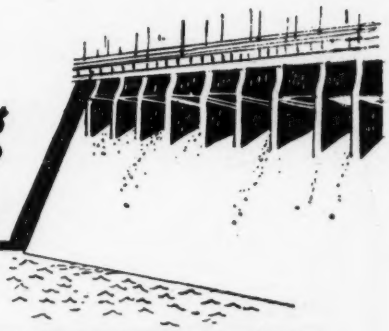

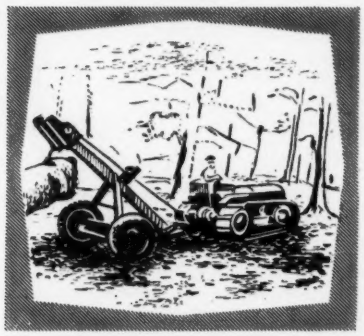

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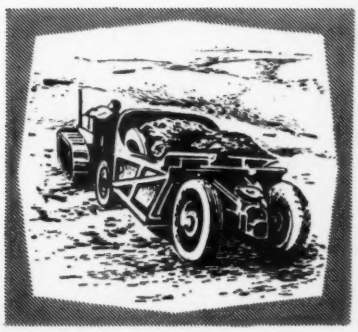

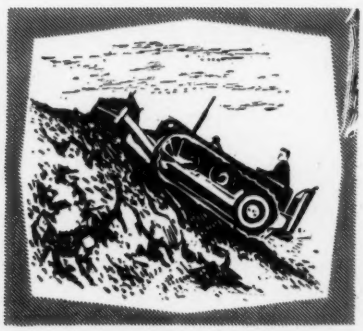

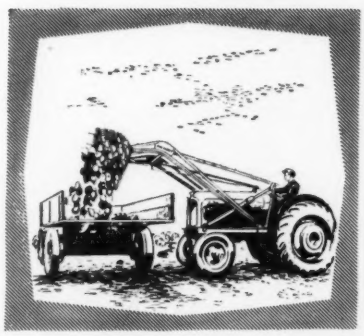

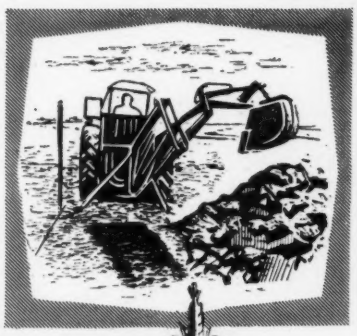

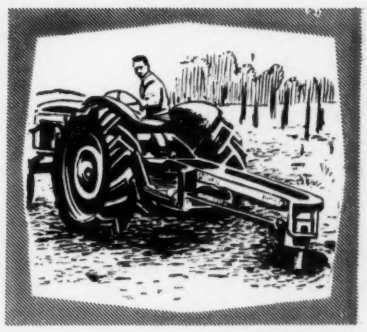

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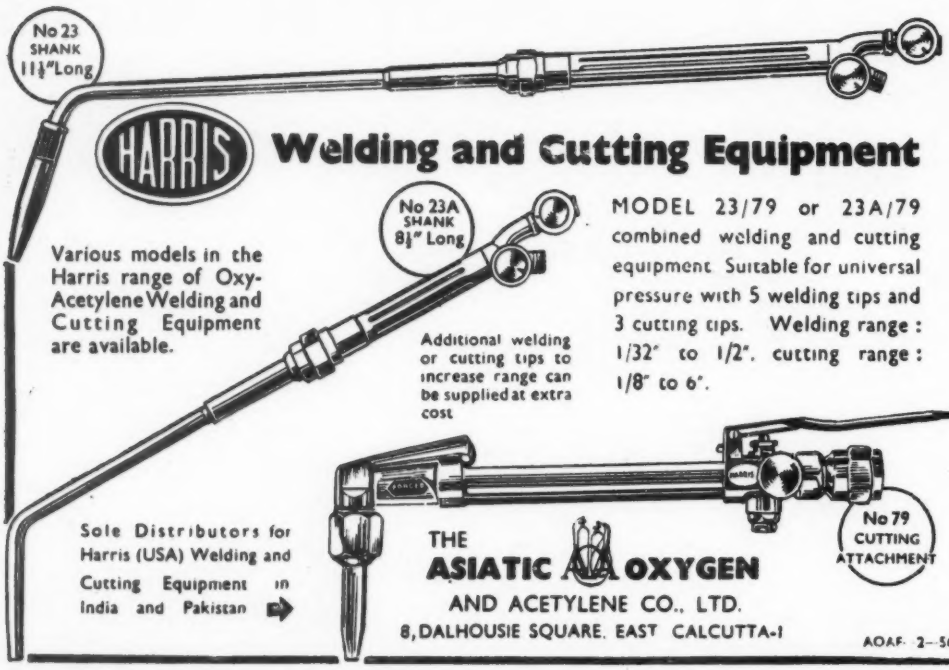
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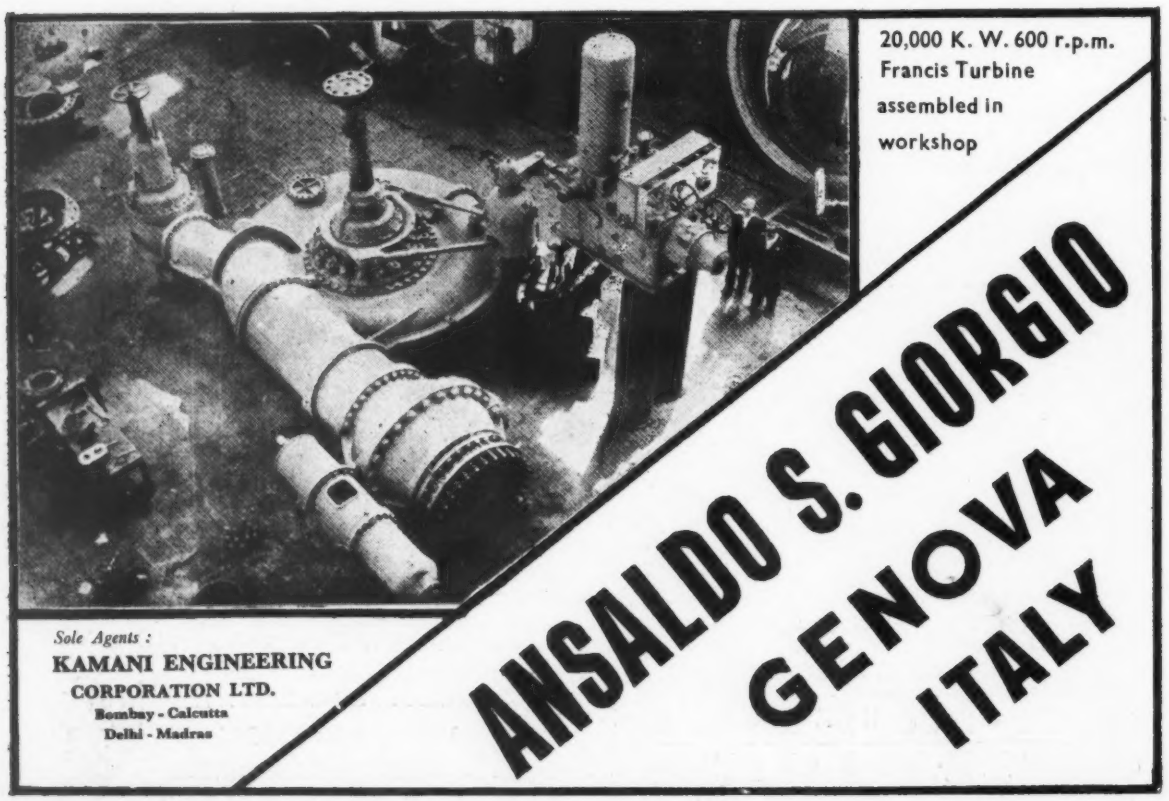
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Irrigation and Power Development in Pakistan

In Pakistan quite a substantial development of power and irrigation has taken place and occasionally news of this trickles down to this country. In order to gain a general idea of the progress so far made the following note has been prepared from the scattered official notes published by the Government of Pakistan and the provinces from time to time. It is hoped that this contribution will be found quite informative.

At the time of Partition, Pakistan inherited an economy which was under-developed in almost all its sectors. She produced 70 percent of the world's jute and had no jute mill. There were but only a few baling presses. She produced large quantities of staple cotton, but only a few cotton mills were in operation. Cultivation was antiquated and mechanization almost unknown.

Improvement in the method of irrigation was an urgent task as the river sources fell mainly in Indian territory. Natural resources had not been tapped. Hydro-electric power had still to be harnessed. Means of comunication were utterly inadequate: railways and telegraphs stood in urgent need of repairs and replacements, while the ports of Karachi and Chittagong were not fully equipped to handle incoming and outgoing cargo. In almost every sphere, a fresh start had to be made.

In conditions such as these, the main objectives of Government policy were to improve agriculture, to secure speedy industrialization and to undertake basic development in the field of power, communications and the like. In order that developmental activity in all directions may proceed in a balanced manner, a Development Board was set up immediately after Partition. It was entrusted with the scrutiny and approval of all development projects. In 1950, the Board was replaced by a Planning Commission and an Economic Council.

Six-Year Development Plan

The Six-Year Development Plan of Pakistan, which formed part of the Colombo Plan, was formulated to cover the period from July, 1951 to June, 1957. It was estimated to cost Rs. 2,600 millions as shown below :

	(*In millions of rupees*)
Agriculture	820
Fuel and Power	470
Industry and Mining	490
Transport and Communications	530
Social Uplift Schemes	290
TOTAL	2,600

Hydro Electric Project, Kaptai, under construction

Power

At the time of Partition, the total generating capacity available in the country was only 76,821 K.W. (10,000 K.W. of Hydel and 66,821 of thermal). The Central Government assumed responsibility under the Development of Industries (Federal Control) Act, 1949, to plan and regulate the development of electricity, and set up the Central Engineering Authority.

Thermal Power

Taking into consideration the acute shortage of power and its pressing demand for industrial development, a Two-Year Thermal Power Priority Programme was evolved for the generation of 140,000 K.W. at a total estimated cost of Rs. 135·7 millions at the following stations :

Chittagong	6,000 K.W.	(Diesel)
Sidhirganj	30,000 K.W.	(Steam)
	9,000 K.W.	(Diesel)
Khulna	10,000 K.W.	(Diesel)
Lyallpur	30,000 K.W.	(Steam)
	10,000 K.W.	(Diesel)
Hyderabad	15,000 K.W.	(Steam)
Karachi	30,000 K.W.	(Steam)

The scheme for 30,000 K.W. steam plant at Lyallpur has been abandoned as it is proposed to set a up power station at Kot Adu which will be worked with Sui Gas. Scheme at all stations except at Hyderabad and Sidhirganj are completed, and have gone into operation in 1955. In addition, there are 10 other thermal schemes, five of which costing Rs. 11.6 millions aim at the generation of 12,168 K.W. power while the remaining five costing Rs. 28.4 millions are intended to provide link, transmission, and distribution facilities. The capacity of thermal power, which stood at 66,821 K.W. both on private and Government account at the time of Partition, has increased more than three times, and now stands at 197,000 K.W.

Hydel Power

At the time of Partition, the hydel capacity was 10,000 at Malakand only. So far 11 schemes have been sanctioned to increase the capacity by 718,400 K.W. at a total satimated cost of Rs. 1,085.6 millions, of these schemes, the Malakand Extension, Dargai Hydel Project and Rasul Hydel Project have so far been completed. These have increased the hydel capacity from 10,000 K.W. at the time of Partition to 62,000 K.W. Other projects are under way in the provinces. Details of the hydel projects are give below.

Project	*Total cost (Rs. million)*	*Capacity K.W.*	*Progress*
Extention of Malakand Project	4.00	10,000	Completed
Dargai Hydel Project	15.65	20,000	Completed
Warsak Multi-purpose Project	221	150,000	Civil works are nearing completion. The Government of Canada have so far provided 8.9 million dollars for this project. They have also agreed that sale proceeds of wheat provided by them during 1952-53 and 1953-54 worth 10 million dollars may be utilized to meet part of rupee cost of the project.
Rasul Hydel Project	85.70	22,000	Completed.
Mianwali Hydel Project	211.4	100,000	This project has not been able to make headway due to non-availability of foreign aid.
Mangla Multi-purpose Dam	730.00	300,000	The sum of Rs. 5.8 millions has been spent during 1954-55 for undertaking preliminary works ; a further sum of Rs. 10 millions has been provided for the project for 1955-56.
Chichoki-mallian, Gujranwala, Khanki and Shadiwal Hydel Projects.	57.43	44,176	Some preliminary work has been done.
Karnafulli Multi-purpose Project.	182.80	80,000	Approval of the project was subject to the availability of foreign aid which has come very late in the form of engineering services of a value of $.75 millions. Now work is progressing smoothly.
Gilgit Multi-purpose Project	0.68	400	Progress on the work held up due to financial stringency.

Hydro Electric Project, Kaptai

Two reputed firms of consulting engineers, M/s. International Engineering Company of the U.S.A. for East Pakistan, and M/s. H. G. Acres of Canada, for West Pakistan, have completed their detailed surveys of power requirements of the country. Government have also entrusted to these firms the work of preparation of separate detailed plans for generation of power in the two zones and their use in the various fields during the next 10 years. In order to speed up power development in the country, Government propose to set up a separate Electricity Commission. This will be the precursor of a Power Development Corporation, similar to the Pakistan Industrial Development Corporation on a sound and commercial basis.

Warsak Hydro Electric Project

Sui Gas

The discovery of natural gas at Sui is an event of far reaching importance in the economy of Pakistan. The quantity of gas is conservatively reckoned at over 2,250,000 million cubic feet which is sufficient to supply 100 million cubic feet per day for more than 60 years. This quantity of gas is equivalent in affective heating value to approximately 1,600,000 tons per year of imported coal. A Company known as Sui Gas Transmission Company Ltd., has been formed with an authorized capital of Rs. 150 millions, and an issued capital of Rs. 37.8 millions, subscribed as under :

(*In millions of rupees*)

Burmah Oil Co. Ltd.,	..	9.261
Commonwealth Development and Finance Corporation Ltd. U.K.	..	9.261
Pakistan Industrial Development Corporation	..	9.639
Pakistani Public	..	9.639

The International Bank for Reconstruction and and Development has agreed to advance a loan of £5 millions for this project and loan agreement to this effect was signed on the 2nd June, 1954.

The main attraction of the Sui Gas scheme is that it will provide indigenous fuel at a cheap price to Karachi and along the entire route where fuel may be required, thereby stimulating and accelerating industrial and agricultural development and reducing the country's dependence upon imported coal. The savings in foreign exchange resulting from the displacement of imported fuels is estimated at about Rs. 12.5 millions per year during the first four years of operation, which will increase to about Rs. 44 millions each year when full load capacity is attained. Work on laying the pipeline has been completed, and it is expected that the gas will be available for use in Karachi by August, 1955. It is proposed to have a power station of an initial capacity of about 100,000 K.W. at Kot Adu. Power would be developed from natural gas to be piped from Sui, and will be transmitted the various important load centres in the Punjab.

Agricultural Development

Extension of irrigation facilities, introduction of modern methods of cultivation, and use of mechanical equipment and fertilizers have contributed greatly to agricultural development in Pakistan. Progress made in this direction since Partition is indicated by the following major projects taken up by Government :

Province & Project	*Estimated Cost*	*Area to be covered*	*Foodgrains Yield*	*Completion Schedule*
Punjab	*Rs. millions*	000 *acres*	000 *tons*	
Thal	154.5	1,167	343	1556-57
Taunsa Project	101.4	710	197	1957-58
Mangla Dam	730.0	3,000	..	1961-62
Marala-Ravi Link	85.2	260	21	1956-57
N.W.F.P.				
Kurrangarhi Weir	26.8	270	50	1957
Warsak High Level Canal	7.0	93	28	1958-59
Sind				
Ghulam Mohammed Barrage.	240.0	2,750	825	1960
Gudu Barrage	283.0	2,294	666	1958-59
Makhi Dhand Reclamation	10.0	150	—	—
Baluchistan				
Nari-Bolan (Phase 1)	3.0	34	85	
Anamber Weir Project	1.2	9	..	Completed
Zargi Tangi	4.9	1	..	Completed
Extention of Sailaba Cultivation	8.7	81	..	1900
East Bengal				
Ganges-Kabodak (Phase 1)	19.6	250	66	1955-56
TOTAL	1,675.3	11,069	..	..

In addition, East Pakistan another big project, Teesta Barrage, costing Rs. 91.3 millions, and expected to irrigate an area over 1 million acres yielding 350,000 tons of foodgrains is being taken up in 1955-56 for execution.

Progress on some of the important projects is described below :

Thal Irrigation Project

The work on the barrage, the amir canal and major distributory system has been completed. Some of the minor distributories are under execution. Thal colonization project, costing Rs. 179 millions, which is closely connected with the irrigation project, aim at reclamation of some 2 million acres out of the total area of 5 million acres of Thal. Some 42,922 families of colonists have so far been settled on 565,316 acres of land.

Taunsa Barrage Project

In addition to providing perennial irrigation facilities to existing irrigated area of 667,000 acres, the project will bring under irrigation an additional area of 710,000 acres in the Muzaffargarh and Dera Ghazi Khan districts of the Punjab. The work on the project is in full swing, and a sum of Rs. 15.787 millions was spent up to the end of 1954.

Mangla Dam Project

It is the most important multi-purpose project which will cost about Rs. 730 millions and is expected to provide irrigation facilities to some 3 million acres of land. A sum of Rs. 5.8 millions was estimated to be spent during 1954-55, and a budget provision of Rs. 10 millions has been made for 1955-56.

Marala-Ravi Link

The main object of this project is to transfer some water from the Chenab to the Ravi, and ultimately to the Sutlej to remove the chronic shortage of water in the Sutlej Valley Canals in Kharif. The work on this project is in full swing and a sum of Rs. 26 millions was spent up to the end of November, 1954.

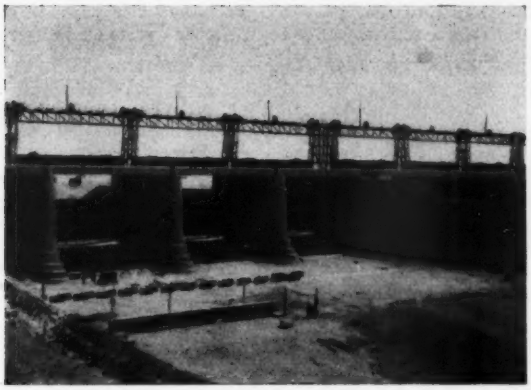
Kurrangarhi Weir

The project aims at improving irrigation facilities to 150,000 acres and bringing 120,000 acres of new land under irrigation. The work on the project is in full swing, and a sum of Rs. 13·566 millions was spent up to the 30th September 1954.

Ghulam Mohammed Barrage at Kotri

The project aims at providing weir-controlled

Tando Masti Fall, Sindh



Kotri Barrage, Sindh

supples of water to the existing inundation canals and extending of irrigation facilities. The right flank feeder canal called Kalari will also provide additional water supply in Karachi. The Barrage has been completed, while the canals are in advanced stages of completion.

Gudu Barrage

This project will connect the Indus water to the various inundation canals in the Upper Sind by means of feeders. With the execution of the project, it will be possible to give assured water supply to the Sind and Baluchistan areas in the North of Sukkur and Rohri. It was originally proposed to construct a reinforced concrete structure, but in order to reduce the expenditure on foreign exchange, it has now been decided to construct a plain concrete weir. The preliminary works on the project are in progress and an expenditure of Rs. 4.165 millions was incurred up to the end of December 1954.

Makhi Dhand Project

This project aims at the reclamation and colonization of land by the provision of irrigation facilities and the clearance of jungle. FOA has committed a sum of $.5 millions for this project. The work on this project is in progress.

Extension of Sailaba Cultivation in Baluchistan

The object of this scheme is to canalize the flood waters in Baluchistan which would be bunded and terraced with the help of tractors and reclaim an area of 240,000 acres over a period of five years. FOA has agreed to a sum of $.13 millions for this project.

Ganges Kabodak (Phase I)

This project envisages the improvement in the irrigation facilities mainly by water pumped from the Ganges. For this purpose, a pumping station, with with a capacity of 20,000 cusecs energized by a steam-power plant of 10,000 K.W. and the necessary irrigation distribution system, has been planned. The execution of this project will enable undertaking of double and triple cropping in the area.

Miscellaneous Projects

An organization to look after the soil conservation problems has been created with its headquarters at Quetta. It has been estimated that 3 million acres can be reconditioned, 4 million acres reclaimed and another 3 million acreas made fit to grow bush and forest. Other schemes cover the important subjects of animal husbandry, fisheries, bee keeping, poultry, etc. Village-Aid Programme is being run to introduce modern methods of cultivation, use of fertilizers, rotation of crops, organization of cottage industries and ultimately to raise the living standard of the rural masses. The results so far achieved under the agricultural development programme are satisfactory. The area under the different crops has increased. The area under the 15 major crops increased from 45,230,000 acres in 1948-49 to 50,559,000 acres in 1953-54, showing an increase of 11.1 percent.

These major agricultural development schemes are

Ghulam Mohammed Barrage

being supplemented by the following projects for which the Government of Pakistan have entered into operational Agrement with F.O.A.

	In dollars	
	1954 *allocation*	1954 *allocation*
Agricultural Machinery Centre and Tractor Workshop Project	500,000	327,375
Agricultural Organiztion Project	435,000	470,260
Makhi Dhand Reclamation Project, Sind	500,000	—
Ground Water Exploration and Test Tubewell Project, Bahawalpur	150,000	—
Punjab Erosion Control and Soil Conservation Project.	85,000	316,500
Extension of Sailaba Cultivation, Baluchistan	130,000	—
	1,800,000	1,114,135

The Agricultural Workshop Project provides for the setting up of Agricultural Machinery Centres and Tractor Workshops on the various Units of Pakistan. Tractor Workshop at Quetta in Baluchistan, and at Tando-jam, in Sind, are almost ready and will begin to function as soon as necessary equipment is received from abroad. Steps are being taken by the Units to set up similar workshops in the N.W.F.P., the Punjab, East Bengal, Bahawalpur and Khairpur. These workshops when completed will provide maintenance and repair facilities for agricultural tractors in the country.

The Agricultural Organization Project aims at organizing and strengthening the Agricultural Services in the various provinces and States, as well as in the Centra. For this project, the Foreign Operation Administration of the U.S. Government are providing trucks, station wagons, jeeps, motor cycles and other office equipment.

The Makhi Dhand Reclamation Project in Sind, and Ground Water Exploration and Test Tubewells Project in Bahawalpur, aim at reclaiming the cultivable land and providing additional irrigation facilities. Most of the equipment has arrived from abroad and the rest is on its way.

The Punjab Erosion Control and Soil Conservation Project is a Pilot Project designed to counteract soil erosion in the upland districts of the Punjab. Necessary equipment under this Project is being received and preliminary work has been started with the help of F.O.A. experts.

The Extension of Sailaba Cultivation Scheme in Baluchistan, will provide a practical demonstration of Sailaba cultivation in order conserve and improve

The famous Sukkur Barrage

the land and surface water resources. Orders for the pruchase of machinery have been placed in the U.S.A. In the meantime, preliminary work is being done on this scheme.

The Government of Australia have made available to Pakistan 200 A.W. 6 International Harvester tractors, worth approximately 325,000 Australian Pounds. These tractors have arrived in Pakistan and despatched to the various Units for utilization on their Grow-More-Food and Mechanical Cultivation Schemes.

Irrigation in West Punjab

Special efforts were made to make the best of irrigation facilities. Area under food crops was increased by 658,264 acres in 1953-54 and by another 94,906 in 1954-55. A total of nearly Rs. 4.8 millions has been remitted in *abiana*, since kharif 1953. A number of short-term schemes resulted in extending irrigated area by 36,372 acres ; another 64,744 acres will benefit when current schemes mature. The Balloki-Sulemanki Link Canal was opened. Work was started on the Marala-Ravi Link. Work was commenced on a scheme to instal 500 tubewells. Another 1,500 tubewells are to be installed on the improvement of the power position. A survey of ground-water resources of the Punjab was started under F.O.A.'s guidance. A number of reclamation schemes were finalized to arrest and cure salinity and water-logging over nearly 900,000 acres. Work was started on four low-head-fall hydel schemes which will generate a total of 89,175 K.W. The Taunsa Barrage Project was taken in hand. This will irrigate 140,000 acres in Dera Ghazi Khan and Muzaffargarh. The Taunsa Barrage canals will also bring 500,000 acres of land under six-monthly irrigation. Special attention has been paid to the development of the northern districts. Several irrigation projects have been sanctioned and seven, out of 30 tubewells sanctioned, have already been sunk by the Swiss Boring Company.

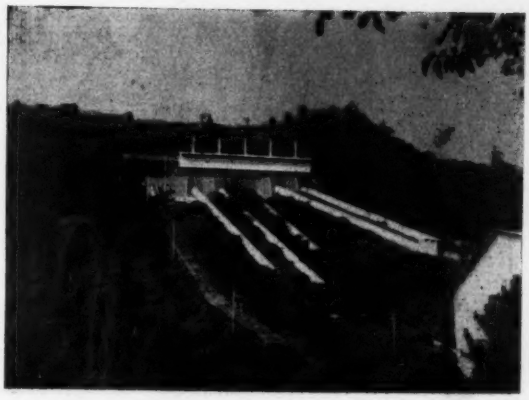
Power in West Punjab

Nearly 11,000 general and 750 industrial connections were given in the Province, and grid system was completed, interlinking all available sources of hydel and thermal power supply. A power-house, with two sets of 1,220 K.W. was installed in Lyallpur, four more such sets are to be installed in the near future. New 8,000 and 1,600 K.W. power-stations was ready by the end of 1955. Another 1,600 K.W. station has been started in Burewala to feed the textile mills there.

One of the two 3,000 K.W. sets has been working in Montgomery by the end of 1955. A 25-mile line has been laid and the rest is being laid to feed small towns in the district. Another 40 miles of lines were laid to feed Campbellpur, Hazara, and Lawrencepur, Villages between Wah and Jhelum are to be electrified.

Irrigation Projects in Sind

The biggest achievement of Sind, during 1954-55 has been the Lower Sing Barrage, now renamed as the Ghulam Mohammad Barrage. The Ghulam Mohammad Barrage, which was formally declared open by His Excellency Mr. Ghulam Mohammad, Governor-General of Pakistan, on the 15th March 1955, aims at conserving and utilising the available water for the irrigation of vast areas of wasteland



Malakand Hydro Electric Project

and for the generation of hydro-electric power to help growing industry.

This barrage has been built across the Indus, near the tiny village of Jamshoro, 41½ miles upstream of Kotri, to feed the four large canals taking off from the pond upstream. Designed to pass 87.50 million cusecs of water it has 44 spans of 60 feet each. The main barrage together with its two abutments and piers, has already been constructed, complete with the roadway and the gates and operating machinery, The barrage has two exclusive features. First it has been equipped with a lock-span for the trans-shipment across of boats and launches which would not be possible otherwise. Secondly, there is the provision of two fish-ladders, one on each side of the two divide-walls, to enable the famous palla fish to reach the northern areas. Four canals will take off from this barrage, with a total capacity of about 41,000 cusecs. The total area of the land to benefit from this barrage is over 2,700,000 acres, of which over 1.50 million is virgin soil.

Associated with this project is the Kalri Lake Hydel Scheme. The head available at the lake is being utilized to develop the power which will be of immense benefit to the ancient, but growing town of Thatta, and its surroundings. The power station is to be joined up to the proposed Lower Sind Thermal Grid.

The construction of yet another major irrigation project since Partition has been taken in hand by the Sind Government. Gudu Barrage, located some 100 river milles north of Sukkur, with two main canals—one on the right bank and other on the left—will give assured supplies to 2,294,910 acres of rich land, presently at the mercy of river inundation. A large canal on the right bank will also irrigate about 200,000 acres in the rich Baluchistan plain. The Gudu Barrage project is estimated to cost about Rs. 283 millions, and is expected to be completed in four years.

A pilot irrigation scheme, known as the Shah Awais Pumping Scheme, has been completed at a cost of Rs. 680,000. A canal 12½ miles in length, along with 3½ miles of Kubi minor, has been constructed to irrigate an area of 22,000 acres of rich land between Sann and Manjnand. It is expected that this scheme will help in the production of 7,500 tons of foodgrains in *Kharif* and about 700 tons in *bosi rabi*.

A Canal in Larkana

Irrigation Projects in N.W.F.P.

Of the major irrigation schemes in progress in the N.W.F.P. the Kuram Garhi, the Pehur Flow irrigation scheme, the Warsak high level canal, Tank Zam and Deraban Zam flood control and irrigation schemes, D. I. Khan district, the Tubewell irrigation schemes in Kohat district, and the Flow irrigation scheme from Sirin river in Hazara district, are the most important.

On the Kurram Garhi multipurpose project, which will be completed in 1957, at a cost of Rs. 35 millions, about 20 millions have already been spent. The Pehur Flow irrigation scheme from the Indus river was originally conceived as a Lift scheme, commanding an area of 18,000 acres, but it has now been made into a Flow scheme covering an area of 60,000 acres, at a cost of Rs. 7 millions, against Rs. 1.70 millions provisionally estimated. It will be completed in 1955. The survey and investigation of the Tank Zam and Daraban Zam schemes was undertaken in 1954 and is likely to be completed before the end of 1955, at an additional cost of Rs. 733,000. The idea is to control the flood waters of Tank Zam and Daraban Zam rivulets, and utilize them for the irrigation of large tracts of wasteland in D. I. Khan district, which is otherwise very fertile. Work on the tubewell irrigation scheme in Kohat district, at a cost of Rs. 1,650,000 is in progress. The Sirin river Flow irrigation scheme which is likely to cost over 1 million rupees, is nearing completion. The object of the scheme is to tap the waters of Ichhar nulla and Sirin river at three separate points for the irrigation of 11,000 acres of culturable land of the Pakhli plains. The irrigation schemes which are proposed to be launched before the end of 1955, are the Kurvi Lift irrigation scheme in Kohat district, and Tubewell irrigation schemes in D. I. Khan district.

Irrigation in Bahawalpur

The total area under irrigation, in 1947 was just over 2.25 million acres which has gradually increased to over 2.50 million acres in 1954. This increase has been achieved in spite of the cut by India in the water-supply of the Sutlej Valley canals serving the Bahawalnagar State, which had resulted in a reduction of 113,411 acres of culturable land in this area.

The Abbasia Extension Project has set as its target 3 million acres of unbroken land to be irrigated and brought under the plough. The project has been divided into three stages. The first stage has already been completed, bringing 135,000 acres under irrigation. The second stage is being taken up. The whole Project will cost Rs. 35 millions.

Agriculture and Irrigation in Frontier Regions in N.W.F.P. and Baluchistan

There were no schemes for irrigation development in the Frontier Regions before Partition, although the land under cultivation was not enough to maintain their inhabitants. Today, in spite of the irrigation sources in this area being meagre and offering little scope for development, efforts have been made to improve irrigation methods. Four schemes are in hand for supplying water for irrigation and other purposes to the Tribal Areas. These are (1) the Warsak Scheme (near Peshawar) which, when completed will bring 66,000 acres of land under irrigation ; (2) the Kurram-Garhi Scheme (near Bannu) which will supply water to about 26 villages in which tribesmen own land ; (3) Tank Zam ; and (4) the Gomal river scheme in the Dera Ismail Khan District, which will supply water to areas in which Bhittanis and Mahsuds own land.

Minor irrigation works are being undertaken in the Kurram Agency in order to encourage afforestation. Test boring for tubewells has been started in the Khyber Agency. As a measure of economic relief, a sum of Rs. 341,000 was spent during 1953-54, executing small irrigation projects and improving existing ones.

A project for reclaiming and developing 60,000 acres in the tribal areas by tractors has almost been finalized by the Planning Commission. As soon as it is approved by Government, equipment will be obtained from one of the foreign technical assisting agencies operating in Pakistan. Large scale farming is possible in certain parts of the tribal areas particulary in the Kurram Valley, Wana Plains and the Sheratullah plains, and these areas will be developed in the near future. Under the Five-Year Development Plan, it is proposed to carry out 34 irrigation projects at a cost of Rs. 13.6 millions.

Hydro-Electric Power in Frontier Regions

The Malakand Hydro-electric Project, which was generating about 10,000 K.W. has since been further extended to generate 20,000 K.W. with a view to supplying cheap power. Another Hydro-electric Project has also been finalized at Dargai, generating additional 20,000 K.W. of hydel power.

Soil Conservation in Damodar Valley

By

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AUTHOR

Nature has given land and water to man and it is up to him to harmonise and co-ordinate these elements to his own advantage. But, unfortunately, he he has not seen to it always. Unwittingly, he has destroyed forests, overgrazed grass lands and managed his agricultural land wrongly. The results of such follies are writ large on the Upper Valley of the Domadar river. This region is a part of the Chotanagpur plateau, dotted with hills and cut up by deep gorges. It gets an average annual rainfall of 51.6″ inches, drained away by a number of fast flowing hill-streams. The area is 7200 sq. miles.

With the disappearance of forests and carpet flora the steep slopes have, down the ages, gone naked ; the monsoon downpur beats against the bare land and rushes down with heavy load of surface soil to the main streams of the catchment. Thus goes on the pernicious process of soil erosion which has been further aggravated by improper methods of upland cultivation. Most of these upland fields in this region are laid along the slopes, from the bald crowns of the hills to their feet. These plots are usually ploughed up and down the slopes. This is out and out a harmful practice leading to deep and rapid erosion.

The problem of soil erosion has become so vast and urgent that the Damodar Valley Corporation Act, 1948 has enjoined upon the Corporation to take up soil conservation measures as a part of its programme to develop the Valley.

In the larger context of the Damodar Valley Project, soil conservation has another vital role to play. It has to stop the menace of soil erosion not only for the protection and improvement of culturable land but also for the preservation of rapid silting up of the river channels and the reservoir beds of the D.V.C. dams. The main reservoirs are at—

(1) Tilaiya, with a capacity of 320,000 acre-feet for a catchment of 380 sq. miles of the Barakar river.

(2) Konar, with a capacity of 260,000 acre-feet for a catchment of 385 sq. miles of the Konar and Siwani rivers.

(3) Maithon, with a capacity of 104,000 acre-feet for a catchment of 2430 sq. miles of the Barakar.

(4) Panchet, with a capacity of 1,214,000 acre-feet for a catchment of 2,430 sq. miles of the Damodar.

The utility of the dams depends largely on the storage capacity of these reservoirs which is vitally affected by the silt load coming in.

Land Reclamation

The D.V.C. plans to carry out its soil conservation programme in close co-operation of the Bihar Government and on the lines suggested under the first Five-Year Plan. At the outset, however, it was faced with a related problem, arising out of the displacement of population in the submergence zone of the reservoirs. The dams of Tilaiya, Konar, Maithon and Panchet submerge about 70,000 acres, including 23,500 acres of paddy fields, and displace approximately 36,000 people from their houses.

Being committed to a policy of resettling these people, the Corporation undertook to reclaim waste land.

Reclamation of waste land in this region was mainly a mechanised earthwork. On higher elevations, where the surface soil was thin and the slope very steep, broad channels, contour ditches and upland terraces have been constructed. Lower down, gullies and other spots suitable for cultivation have been reclaimed for bench terraces.

It is a badly eroded area. The slope of the land varies from 5 per cent to 5 per cent, involving heavy movement of earth. In Tilaiya and Konar areas, where the reclamation work was early taken up, any number of gullies had to be plugged for forming paddy fields and preventing further erosion. The following table will show the areas reclaimed so far :—

TABLE 1

Project	*Upland*	*Paddy fields*	*Total*
(1) Tilaiya	1515.46	2979.56	4495.02
(2) Bokaro	8.83	52.42	61.25
(3) Konar	—	401.26	401.26
(4) Maithon	4.49	1581.79	1586.28
	1528.78	5015.03	6543.81

An example of Soil Erosion in the DVC area

After reclamation, these fields were put under post-reclamation treatment for increasing their fertillity. This has been done through green-manuring with phosphate fertilization before they were handed over to the Rehabilitation Department of the D.V.C. for allotment to the displaced people. In some fields test cropping with paddy have also been carried out to demonstrate their ability to grow this crop.

Small irrigation ponds have also been made in some of the suitable sites for providing irrigation to the reclaimed fields.

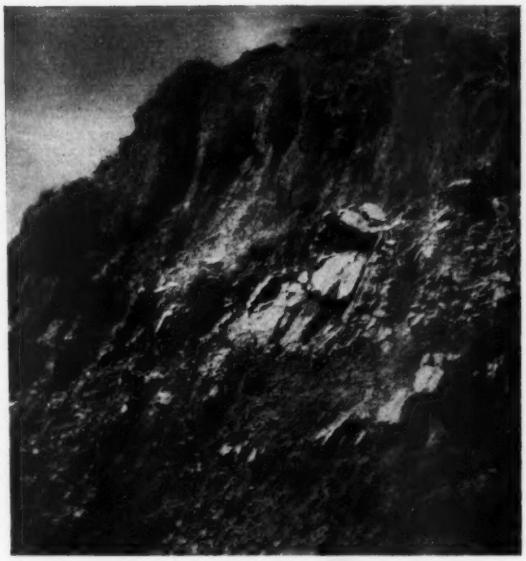
Initial handicap

The D.VC.started its soil conservation programme under a serious handicap. The basic data, which are so essential for any planned work, were not available. The only maps, showing forests and culturable areas, and the topographical maps on the scale of 1″, ½″ and ¼″ to the mile and contours of 50 ft. to 250 ft. These maps were prepared about a generation ago. Since then the distribution of agriculture and forests have considerably changed, and this calls for fresh survey and more detailed maps. So, with the help of leading soil scientists of the country, the Corporation has evolved a standardised method of survey. The entire Upper Valley of 7200 sq. miles has been air-photographed, and air-mapping is in progress. Maps of about 5,000 sq. miles have so far been printed. These are being prepared on a scale of 6″ to a mile, with 10 ft. contours and other topographical features.

Soil Survey and Land Use Planning

For land classification and land use planning, types of soil, erosion and present land uses are also being systematically mapped within each watershed. An area of 374 sq. miles has been surveyed for reclamation and soil conservation of which nearly 210 sq. miles have been a soil mapped on a scale of 16″ to a mile for soil conservation planning. These maps will show details of soil depth, top-soil and sub-soil texture, permeability, extent and direction of slope, external drainage pattern, and sheet and gully erosion. In the commanded areas of the headwater-dams, soils of waste land, denuded forests and gullied areas are being classified on the basis of soil morphology for their suitability or otherwise for irrigation. About

Contour cropping at Deochanda



Soil Erosion showing exposed rocks

7,000 acres have so far been surveyed and their irrigability maps prepared.

TABLE II

Place	*Area soil-mapped in acres :*	
(1) Charwa commanded area	1,500 acres	
(2) Gonda commanded area	1,000 acres	
(3) Jugra & Ghagra commanded area	2,500 acres	
(4) Tilaiya high level irrigation area	15,000 acres	(Reconnaissance survey only)
(5) Jamunia commanded area	2,00 acres	

In the areas commanded by the four major dams soil fertility and crop cutting surveys have been carried out on 7,000 acres.

Bad management of land has spelled wide scale ruination in the Damodar Valley. For repairing these damages a particular piece of land should be put under the use for which it is best suited and should be given the treatment it needs. For example, a land which is suitable for trees only should be put under forest and should not be put under agricultural crops. In order to be able to do so, the capability of a piece of land has got to be determined and land-capability maps prepared for the area. The Corporation has so far drawn up maps and plans for about 1,00,000 acres. For the implementation of these suggestions detailed contour survey of blocks of land has been undertaken. This will determine the specifications of terracing, gully control and water disposal methods.

Headwaters Engineering

In a region like the Damodar Valley, soil conservation measures cannot be comprehensive unless the "little waters" of the various watersheds are tapped. These "little waters" when left to themselves, have immense propensity to eat away the soil and, ultimately, lead to heavy erosion ; and, when properly utilised, these make irrigation possible at high elevation and the menace of erosion as well is brought under control. The D.V.C. is investigating the possible sites for headwater control dams in the upper catchment of the valley. The major reservoirs of the four D.V.C. dams are designed to store a total run-off of about 40% of the average annual yield from the Valley. Therefore, it is obvious that year after year about 60% of the average annual yield runs to waste. The run-off coming from the upper catchment is laden heavily with silt, and the silt will ultimately be deposited in the major reservoirs, thereby reducing their useful life. If this run-off is checked and stored at suitable dam-sites in the upper catchment, the silt will not get the chance to reach the major dams.

Headwater dams are located always in such places where the stored-up water can be harnessed to some useful purposes, and the D.V.C., while selecting sites of these dams, is having three main objectives to achieve :

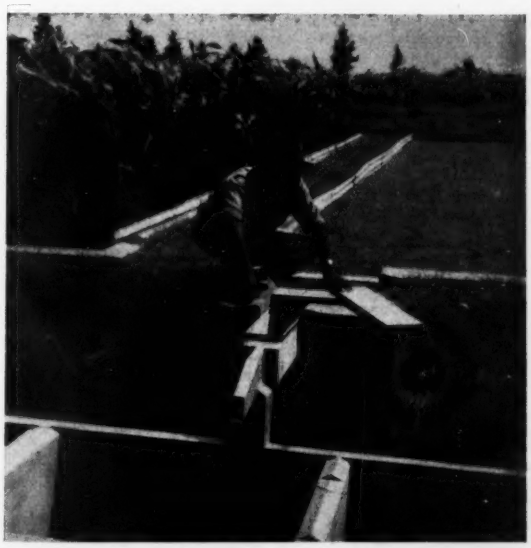
(1) Irrigation of existing cultivated and cultivable lands.

(2) Water supply to towns and large villages.

(3) Storing run-off from the catchment in wet years and carrying it over to dry year and releasing it during the dry year for generating higher firm powers at the major reservoirs of the project.

Three projects in the vicinity of Hazaribagh has so far been executed—at Gonda, Charwa and Jamunia. Another such dam has been constructed near Ranchi to supply water to the town. Two more schemes,

Run-off experiment at Deochanda.



A canal from Charwa headwater dam near Hazaribagh

investigated and designed to irrigate about 12,500 acres, have been taken up for execution by the Government of Bihar. A headwater dam is under construction near Giridih to supply water to the town. Another scheme comprising six more such dams has been approved for implementation. A pilot project for intensive soil conservation, on an area of about 250 acres near the Gonda dam, involving use of all types of structure for soil conservation and gully control has been completed. This project also includes the treatment of upland and small system of irrigation from a conservation tank.

Forestry

As a part of its soil conservation programme the D.V.C. must also put denuded areas under forest. For, forest serves as a very good soil-conserving agent. The objects of management of the reforested areas are primarily to reduce soil erosion and, thereby, to decrease the siltation rate of the reservoir and to supply timber to the villagers for their domestic use. About 2,000 acres have so far been afforested. This includes 300 acres, which is ready for thinning and is expected to provide firewood, grass fodder and small fence posts etc. to the villagers. Besides, more barren and steep hill-slopes have been selected for afforestation at the rate a of thousand acres annually.

The Forestry Section of the D.V.C. Soil Conservation Department is conducting research into problems of afforestation met with in the locality. The investigations relate to selection of rapid growing and draught resisting species, determination of the best method of plantations under local conditions and introduction of suitable exotics.

Research and Extension

The D.V.C. has set up a soil conservation experiment station at Deochanda where comprehensive soil conservation measures are being evolved. Different types of terraces and different systems of cropping are being studied and various kinds of grass, legumes and trees are being tried out for their usefulness in conserving soil. Run-off plots have been established on different slopes for studying run-off and soil loss under different cropping practices. Lysimeter experiments are being conducted for finding out how much of the plant nutrients are being lost into the deeper layers of the soil during the monsoon. *Gora* and upland paddy has been found here to be of great promise both as a soil cover as well as a fairly high yielding crop. This is beng successfully introduced among the local farmers for replacing the existing low yielding upland crops like *gondli* and *marwa*. Of all the terraces tried here graded terraces have so far been found to be best suited for this locality for upland crops. The *giant-star* grass of Africa has been found to be of great value in protecting the down-stream face of the earthen embankment and this has been successfully used on some of the D.V.C. earth dams. Studies with the fodder crops at this station have shown the suitability of *Blue-panic* as a grass for this locality. This is a very hardy and drought-resistant and perennial grass which is being introduced on the lands of the local farmers with good results.

The results of these experiments are carried to the villages by a corps of extension workers who demonstrate to the cultivators of better systems of land and crop management. Thus active participation of the villagers in the soil conservation measures is being enlisted. For, after all, it is the people themselves who must know how to preserve and improve their land. The response from the villagers is very encouraging. The extension staff has covered more than 22 villages and run 31 demonstration centres involving 1162 acres. Encouraged by the results, the D.V.C. is extending its extension work over a larger area and in collaboration with the Community Project and National Extension administration of Bihar.

Another scheme for soil conservation work on 30 sq. miles of Sewani catchment has also been taken up. An area of about 300 acres in the 30 sq. miles catchment has already been completely treated with proper run-off retarding and other soil conservation measures.

Emerging Land Research & Demonstration Farms

The four D.V.C. reservoirs—Tilaiya, Konar, Maithon and Panchet—are expected to submerge and expose annually an area of about 40,000 acres in the peripheral zone due to their filling during the monsoon and draw-down after the monsoon respectively. The agricultural potentiality of this area is expected to be very high because of this periodic submergence and exposure. Therefore the D.V.C. has established a small research-cum-demonstration farm in the village Sewai on the Tilaiya periphery to find out how best such lands could be used and with this idea various crops and cropping practices are being tried both with the ascending and descending water. Deep water paddy which is unknown in this area has shown great promise is this farm and is being successfully introduced among the local farmers for such areas. Two small demonstration farms on the Tilaiya periphery—one at Bundu and the other at Urwan as well as one on the Konar and one on the Maithon reservoir peripheries have been started this year with the same objective in view.

(*Continued on page* 30)

Our Delhi Letter

(From our special Correspondent)

Shortage of electric power haunts Delhi in its grim form. Every day and night of summer the problem assumes a more acute form for the common man, as the standard of living is primarily based on electrification of the kitchen, the home, the office and the street.

The completion of the Kotla power plant has brought the promise for another ten thousand K.W. to Delhi, but how far can 10,000 K.W. go in a capital whose population has more than doubled in the last eight years. The avenues of employment have to widen considerably in the industrial field. This is dependent on the availability of cheap and adequate power if it can be got, without having to wait too long. At present the queues on the waiting list are too long and frustrating.

What are the authorities doing? Less than two years ago one section of experts made a gross error by under-estimating the load growth.

Pessimistic planning

They argued that because the development of load in the past had been so slow, the government would be making too early an investment, if besides Ganguwal and Kotla, they would also be constructing the Bhakra Dam Power Plant immediately. They went to the extent of saying that either no unit should be installed concurrently at Bhakra or at the most one of the 90,000 K.W. be constructed. Even this was also conceded as a compromise with the progressive section of experts who urged the view that the old yard-sticks were obsolete and should be buried. The truth that emerged was wholly in line with the more progressive thought and the lesson is written on the wall in clear letters provided one has eyes to see.

But is this lesson being used in guiding today's and tomorrow's policies and decisions? They are talking about satisfying the immediate needs of Delhi by the augmentation of the existing thermal steam plant and the importation of a few 1,000 to 2,000 K.W. size diesel generators.

This may be justified on the basis of satisfying the immediate demands but it will be again an eyewash because the shortage of power is both chronic and collossal.

Bolder step needed

Along with the short term palliatives, action needs to be taken for providing some 200,000 K.W. of power for the Delhi area alone. Before the authorities have been able to make a revised forecast of load, it will have jumped upto new dimensions and there will again be the hue and cry against shortage of power in another two years.

Let us look at the picture of other progressive countries which have passed through this problem in recent post war years. Leaving U.S.A. alone,countries like Germany and Austria have a lesson for India.

Full employment conditions have been created in these countries through adequate electric power. Irrespective of the fact that hydropower installations in these countries give many times the amount of power per capita, further installations are going on with almost warlike zeal in order to foster new industries in these countries.

The vicious cycle of less power and lesser demand has been broken by placing adequate power on the line. The demand looks after itself and always exceeds the supply, and this enables keeping of the power rate at a profitable level.

The solution for the North region of India is to increase the power generation to its maximum potentiality on a planned basis.

Build Bhakra Right Power Plant also

The total power of 400,000 K.W. (firm) should be generated at the Bhakra Power Plant in a single operation. It follows that not only the five units on the Left Power Plant should be installed but the same number of units on the Right Power Plant should also be undertaken without further loss of time in a full-fledged effort.

The construction of such a work by itself will take three to five years, which is enough time for further load to build up. Again it is to be remembered that the nourishment of the growth of load is best achieved in an atmoshere of producing a commodity in plenty and lowering its sale price. In this manner the total profits for the state will still be high and the needs of the small scale and the large scale industeries will be met at workable level of cost, promoting the good of both parties in the venture.

For the primary objective of providing water for irrigation for arid areas, the goals and targets must also be kept ambitious.

It is to be remembered that the food position in this country is still critical and the standards of nourishment are sub-normal and precarious. India is by no means amongst the first rank countries like U.S.A., Canada, Australia or New Zealand where food, dairy products and meat are in real plenty, for giving the people a high standard of body nourishment.

Lot of ground remains to be covered

With the ample manpower that the Indian subcontinent possesses it should not at all be difficult to make this country a real fountain of milk or honey provided efficient planning and execution are arranged to harness the vast potential that still exists unutilised. Specifically speaking, the instance may be remembered of the Delhi region itself. Motoring from Delhi to Ambala in the North and Mathura and Agra in the South East and Alwar and Rajasthan in the South West, one cannot but be impressed with the vast stretches of land that lie undeveloped due to lack of water. There are ample flood waters in the Jumna, Ghaggar, Ganges, Sutlej and the Beas which can provide all necessary storage for the amelioration of the region.

Our wrong financial yardsticks compared with other countries

So far in India, the financial yardsticks have remained too conservative and unenterprising. One has to remember that in progressive countries like U.S.A. the water resources provided by nature have been stored in one catchment and lifted hundreds of feet by pumping for use in an adjoining catchment. Examples are the Central Valley Project, Delta Mendotta Canal, Big Plants in the Grand Coulee and the Colorado Big Thompson projects. These schemes have demonstrated that we can resort to even 200 feet of pumping and still run the projects as commercial proposition.

Besides the high costs of works, these countries have the problem of settling new people on lands. It is again noteworthy that the Indian hyrdo-electric plants like the Bhakra have a lot of secondary power potential which does not appear to be saleable to the usual industry. Such power will be ideal for pumping water and irrigation schemes and thus give a double advantage for the success of power and irrigation. aspects.

There will be a lot of sceptics and critics against such bold ventures but that have only to study and visit the schemes of other countries to get convinced.

Another thought that is considered vital by the engineering circles in this country is the handicap on the financial and administrative side, where they are not their own masters. Proposals for extension for investigations and research facilities do not receive encouragement and support. Years and months pass in the preparation of cases in file writing and paper work. It is a sorry state of affairs and urgently needs to be altered so that the country's water wealth be brought into service more fully for ending the poverty of standards in the fields of agriculture and industry.

Needed higher professional standards

One fact stands out for urgent attention by the engineering profession themselves. The standards of technical and professional service must be raised. The schemes vetted by Engineers must have the stamp of technical excellence so as to inspire respect and confidence. No engineer of repute should lend his approval or signature under any political or sectional pressure. If they are forced to do so they should bring out that the responsibilty of the financial burden belongs to the politicians, so that on the day of judgement the people of the region and the country might not remain in the dark as to the real causes and effects. For this purpose there should be more informal conventions and meetings amongst engineers so that the opportunity for the exchange of views is multiplied.

At present the technical people in the country remain isolated in their cells and their hard work in the technical field is vitiated by the lack of awareness in the public relations sectors of the country.

(*Continued from page* 28)

Soil Conservation in Damodar Valley

Fisheries

Another aspect of this department's work is the exploitation of large reservoirs for fisheries and to train the villagers how best to utilize the village ponds and tanks profitably by rearing fish in them. Experiments are also being run in small ponds to find out the best method of raising fish as well as for selecting species most suitable for this area both for large reservoirs as well as for small village ponds which are mostly seasonal.

Laboratory

There is a fairly well-equipped soils laboratory at Hazaribagh where soil, rock, plant, water, manure and fertilizer samples are analysed for furnishing information for the different works that are going on under different sections of this department here.

An agricultural experiment station over an area of 210 acres has been started at Panagarh. Here experiments on irrigation farming are being conducted. The main purpose of this station is to evolve techniques for economic utilization of water for irrigation, proper dosage of manures and fertilizers, and better crop management under different phases of irrigation.

FLOOD CONTROL MEASURES IN WEST BENGAL

An extensive survey of the catchment area of the various rivers in West Bengal is being undertaken with a view to stabilising this area—a step which, according to engineers, can alone provide permanent relief to the people from catastrophic floods which are now a regular feature.

Meanwhile the Government of West Bengal has executed short-term schemes which have afforded adequate protection to several towns vulnerable to floods every year and saved vast areas comprising valuable cultivable forest lands and tea gardens from from erosion.

The major towns protected are Jalpaiguri, Cooch Behar, Silliguri, Alipur Duar and Mathabhanga. The total expenditure incurred on these schemes is estimated at Rs. 215 crores.

The rivers in West Bengal mostly originate from Sikkim and Bhutan and some from Darjeeling and Kalimpong hills. Of these rivers causing considerable havoc every year, river Teesta and Torsa stand out prominently. The catchment areas of these rivers were previously thickly weeded due to which the rivers, therefore, never used to carry much silt. From the recent analysis it is found that silt contents of all the rivers are now very heavy. This is mainly due to the fact that hill slopes have been disturbed by very illegal removal of forest cover, the silt that is carried is ultimately deposited in the river beds which are gradually rising thus causing serious floods. The real cause of deterioration of the river and subsequent floods is attributed to the deterioration of the catchment area. Extensive afforestation is stated to be the only way to stabilising the catchment area.

Editorial

A Good Book

We owe a debt of gratitude to Dr. Hart for having written the book "New India's Rivers"*. And here by 'we' is meant the Indian people in general and the engineers engaged in river valley projects in particular. While he was in India going round and interviewing engineers, officers and administrators, there were many eyebrows raised about his *bona fides*, a foreigner that he was. There were even some who simply did not believe that he was at all interested in the study of river valley projects of India. Now that the book is out, at least this Journal feels a sense of moral responsibility to thank him publicly for his work and to point out to many of our countrymen that the author has done what should have been undertaken by an Indian. What is of greater significance, however, is that although Dr. Hart is an American, the book reads as if it was written by an Indian who loves his country and knows its activities, past and present, thoroughly, in this particular sphere. It is a book that not only every engineer but every educated Indian should go through to have a full glimpse of the great work that is going on in India on its rivers, the problems she is facing and the courageous way in which she is meeting them. The book has been dedicated to "all who *died* without seeing the new India" that is being built. Should it also not be addressed to all those who *live* without seeing how the new India is being built? There are many in this category.

The author is not an engineer by profession. While that may have been an inadequacy, he has planned and shaped the book with an artist's imagination. The first chapters deal with the mythological and religious background of the great Indian rivers and the river-based civilisation and cultures, as well as with two great pioneers—Captain Cautley and Sir M. Visvesvaraya—which integrates the present efforts with the past ones and gives a sense of continuity and development to the mighty endeavours of today. This is needed much more than is generally appreciated, because without a sense of history and tradition the mind becomes rootless and unsteady, inspite of its high intelligence and brilliance.

The book does not deal exhaustively with all the projects India has in hand; nor does it deal in technical details with even those large ones which it has covered. But that does not take away the merit of the book which essentially consists in providing a sense of wholeness and integralness to the total endeavour. Secondly, it relates the technical aspects of the problems to their human, social aspects. Thirdly, it indicates the manifold problems, some of which are more implicit than explicit, without pretending to solve them by easy formulae: it puts them in a context which both informs as well as provokes intelligent reaction in the mind of a responsible countryman.

Finally, the book indicates how those who are engaged in this magnificient constructive task, are, even unawares, creating new values—new engineering, new management, new planning, new scale and new pace—and thus lifting the Indian colonial engineering scene of the past two centuries to new heights, new perspectives, new realms of design and technique.

The final chapters compare these efforts with those of other countries including those of the much-debated Russia and China in this particular field of activity. The conclusions are inspiring no doubt but, again, the author very correctly measures them against the "needs" of the rising population of the country and advises that however great the present endeavours as landmarks of engineering achievement in the historical context, their social purposes will hardly be able to compete with those needs unless the population itself is controlled. Thus the book points to the inevitably close collaboration needed between physical engineering and social engineering.

Most engineers are experts and specialists in the sense that while they concentrate on the 'tree' they get lost in the 'wood'. This is one of the inevitable tendencies of technology-based society. Dr. Hart's book provides an excellent material for widening the horizon of our engineers while it gives an insight into the problems of the engineers of river valley projects to our legislators, administrators, economists, politicians and social workers in the language they can easily grasp.

Finally, we are glad that "New India's Rivers" excellently serves the purposes and aims for which this Journal exists and, further, that in the production of the book, this Journal proved to be so helpful to the author as the innumerable references to it indicate.

* *Published by Orient Longmans, Calcutta*

TRACTAMOUNT ROLLER PRODUCTION IN INDIA

"Roads are the arteries of the nation on which depends the prosperity and future of a country", said Mr. M. M. Naik-Nimbalkar, Minister for Public Works, Government of Bombay, on Saturday.

The Minister was performing the Inauguration Ceremony of the KAMANI-TWOSE 'Tractamount' Roller Production Line at the Works of Kamani Engineering Corpn. Ltd. at Kurla. He stated that though the country was lagging behind in the matter of road mileage and communications, it had made great strides after the advent of independence.

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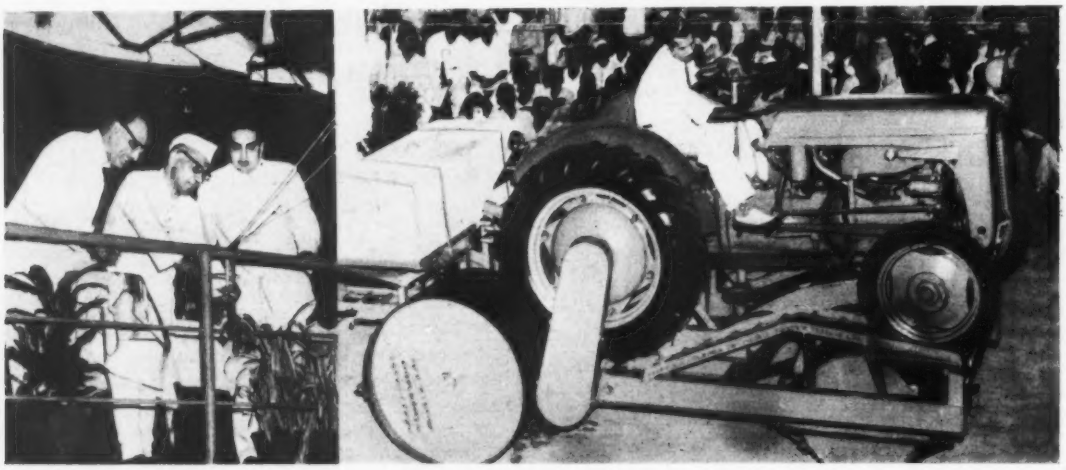

Left: **Mr. M. M. Naik-Nimbalker, Minister for Public Works, Bombay, inaugurates the ceremony.**
Right: **The demonstration of the "Tractamount" Roller.**

A demonstration of the 'Tractamount' Roller proved to the audience that the procedure of mounting the tractor and preparing the roller for work took less than eight minutes. The 'Tractamount'

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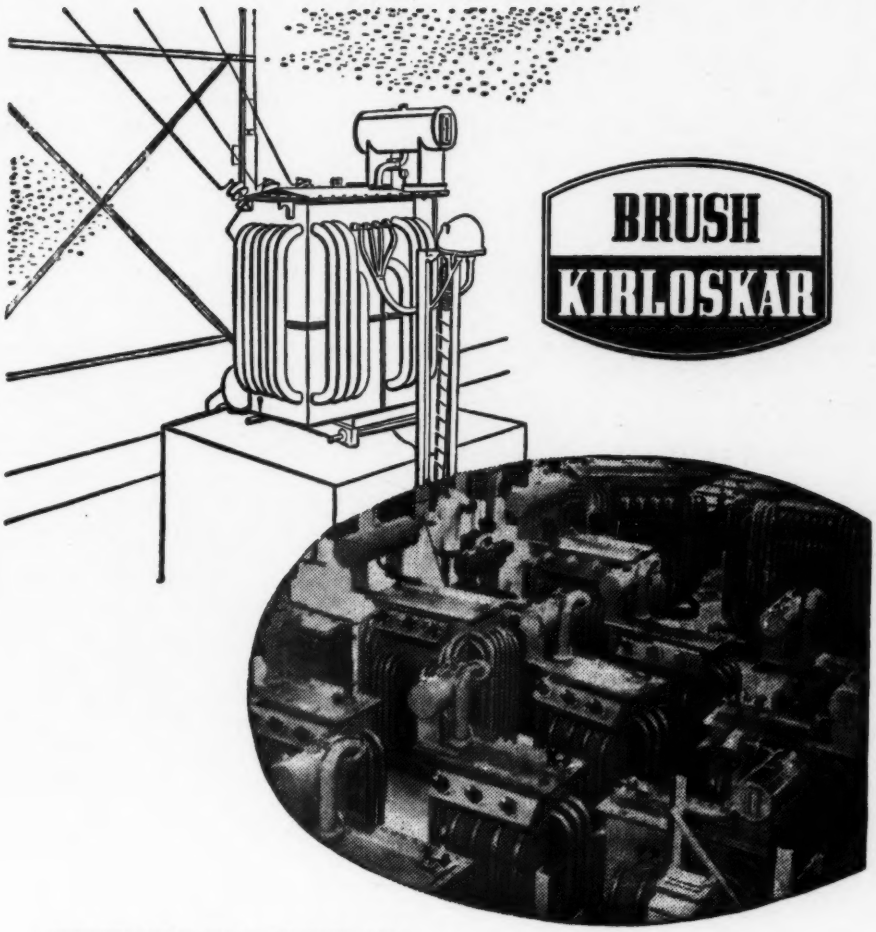

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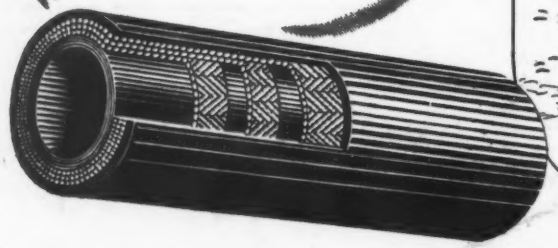

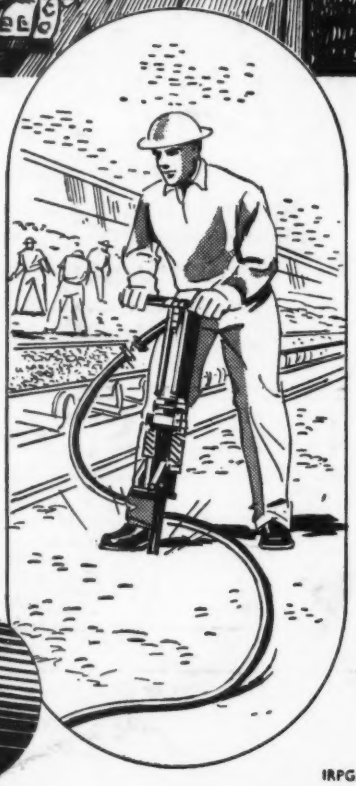

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